

- ✓ 26. A 50-year-old woman with chronic obstructive pulmonary disease (COPD) comes to the office to discuss smoking cessation. The patient says she has tried to quit smoking five times in the past but has been discouraged because each time she resumed smoking. Medical history is also significant for hypertension. Medications include ipratropium, albuterol, and amlodipine. The patient has smoked two packs of cigarettes daily for the past 35 years. BMI is 18 kg/m². Vital signs are temperature 36.7°C (98.0°F), pulse 70/min, respirations 16/min, and blood pressure 120/70 mm Hg. Physical examination discloses clubbing of the fingers. Auscultation of the lungs discloses scattered wheezes. The patient says she is willing to make another attempt to quit smoking and to set a quit date. Which of the following is the most appropriate next step?
- ☐ A) Advise her that there are no treatment options since she has failed quit attempts in the past
 - ☐ B) Advise her to use an over-the-counter nicotine replacement
 - ☐ C) Give her a telephone number for a smoking cessation hotline and advise her to chew gum
 - ☒ D) Prescribe varenicline and refer her to a smoking cessation class



42. An 82-year-old woman with hypertension comes to the office because of a 2-month history of easy fatigability and shortness of breath with mild exertion. She says she has to use two pillows **s to sleep** and breathe comfortably. She had a myocardial infarction at the age of 75 years. Her medications are hydrochlorothiazide, fosinopril, and potassium supplementation. She has never smoked cigarettes. Her pulse is 100/min, and blood pressure is 150/100 mm Hg. Crackles are heard at the lung bases bilaterally. There is pitting edema of the lower extremities. No other abnormalities are noted. Which of the following is the most likely set of findings in this patient?

	Sympathetic Tone	Renal Blood Flow	Urine Sodium Concentration
<input type="radio"/> A)	Decreased	decreased	increased
<input type="radio"/> B)	Decreased	increased	increased
<input checked="" type="radio"/> C)	Increased	decreased	decreased
<input type="radio"/> D)	Increased	decreased	increased
<input type="radio"/> E)	Increased	increased	decreased



46. A 21-year-old man comes to the office for a follow-up visit 1 week after urine dipstick analysis, performed for a sports physical examination, showed an increased protein concentration. He is asymptomatic. There is no personal or family history of serious illness. The patient does not smoke cigarettes, drink alcohol, or use illicit drugs. He trains for college basketball most of the year. He is 191 cm (6 ft 3 in) tall and weighs 84 kg (185 lb); BMI is 23 kg/m². His temperature is 36.7°C (98.0°F), pulse is 58/min, respirations are 10/min, and blood pressure is 126/76 mm Hg. Examination shows no abnormalities. Results of laboratory studies are within the reference ranges. Urinalysis shows 1+ protein. Spot urine protein:creatinine ratio was <0.2 at 8 AM and 0.7 at 4 PM. Which of the following is the most appropriate next step in diagnosis?

- ☐ A) Cystoscopy
- ☐ B) 24-Hour urine collection for measurement of total protein concentration and creatinine clearance
- ☐ C) Renal biopsy
- ☐ D) Renal ultrasonography
- ☒ E) No further studies are indicated



12. A 32-year-old woman is scheduled for elective surgical correction of bladder prolapse. A recent echocardiogram showed mitral valve prolapse but no mitral valve insufficiency. She has no history of serious illness, and she takes no medications on a regular basis. Her temperature is 36.8°C (98.2°F), pulse is 84/min, respirations are 12/min, and blood pressure is 90/58 mm Hg. The lungs are clear to auscultation. A grade 2/6, systolic ejection murmur is heard at the cardiac base, and two early systolic clicks are heard at the left sternal border. Which of the following is the most appropriate antibiotic prophylaxis for this patient?

- ☐ A) Oral administration of amoxicillin 1 hour preoperatively followed by one-half dose 6 hours postoperatively
- ☐ B) Intramuscular administration of ceftriaxone 1 hour preoperatively
- ☐ C) Intravenous administration of amoxicillin and gentamicin 30 minutes preoperatively
- ☒ D) Intravenous administration of vancomycin and gentamicin 1 hour preoperatively
- ☐ E) No antibiotic prophylaxis is needed

✓ 33. One week after an uncomplicated spontaneous vaginal delivery, a hospitalized 27-year-old woman, gravida 2, para 2, has a temperature of 38.7°C (101.7°F). During the past week, her temperature has ranged from 37.2°C (99°F) to 38.7°C (101.7°F). Pregnancy was uncomplicated. She has been receiving broad-spectrum antibiotic therapy for the past 5 days. Blood and urine cultures were negative on postpartum days 2 and 5. Today, she appears comfortable. Her pulse is 72/min, and blood pressure is 102/64 mm Hg. Pelvic examination shows a small amount of vaginal discharge and no uterine tenderness. Her leukocyte count is 14,000/mm³. Yesterday, her leukocyte count was 18,000/mm³. Which of the following is the most likely diagnosis?

- ☐ A) Antibiotic resistance
- ☐ B) Endometritis
- ☐ C) Pneumonia
- ☒ D) Septic pelvic thrombophlebitis
- ☐ E) Wound infection



1. Ten newborns who were cared for in the same nursery develop a pustular rash within a week of discharge from the hospital. Culture of skin lesions grows *Staphylococcus aureus*. Which of the following is the most likely source of the infection?

- ☐ A) A bassinet used in the nursery
- ☒ B) A health professional in the nursery
- ☐ C) Mothers of the newborns
- ☐ D) Siblings of the newborns
- ☐ E) Soap used in the nursery

Correct Answer: B.

In this scenario, a health professional in the nursery is the most likely source of the infection. *Staphylococcus aureus*, particularly methicillin-resistant *S. aureus* (MRSA), is a common commensal bacterium that colonizes the skin and clothing of health professionals. Though health professionals may be asymptomatic and noninfected, they are believed to serve as MRSA vectors. MRSA is associated with neonatal morbidity. Primary prevention strategies include hand hygiene and contact precautions among health professionals around patients known to be colonized or infected with MRSA. Second-tier strategies are needed in units with increased MRSA rates and include surveillance of asymptomatic individuals and targeted or universal decolonization with topical treatments.

Incorrect Answers: A, C, D, and E.

A bassinet used in the nursery (Choice A) and soap used in the nursery (Choice E) are less common sites of colonization compared with the skin and clothing of health professionals.

Mothers of the newborns (Choice C) and siblings of the newborns (Choice D) are less exposed to people colonized or infected with MRSA compared with health professionals, who come into contact with multiple patients with potential MRSA daily.



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2. A 62-year-old woman comes to the physician because of a 3-day history of low-grade fever, cough productive of green sputum, and progressive shortness of breath. Initially, her shortness of breath occurred only with exertion, but last night she had to sleep in a chair to breathe. She has type 2 diabetes mellitus treated with diet and glipizide and mild congestive heart failure treated with lisinopril. Her temperature is 37.5°C (99.5°F), pulse is 110/min, respirations are 24/min, and blood pressure is 140/60 mm Hg. Breath sounds are decreased over the left lower lung field, and there is dullness to percussion. A grade 2/6 midsystolic murmur is heard. An x-ray of the chest shows a large left pleural effusion. A thoracentesis is performed. Laboratory studies show:

Serum	
Total protein	7 g/dL
Lactate dehydrogenase (LDH)	230 U/L
Pleural fluid	
pH	7.1
Glucose	20 mg/dL
Protein	6 g/dL
LDH	200 U/L

Which of the following is the most likely diagnosis?

- ☐ A) Chylothorax
- ☐ B) Congestive heart failure
- ☒ C) Empyema
- ☐ D) Pulmonary embolism
- ☐ E) Tuberculosis

Correct Answer: C.



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Correct Answer: C.

This patient initially presented with evidence of community acquired pneumonia and parapneumonic effusion. In some cases, a parapneumonic effusion may develop into an empyema, which is defined by bacterial infection of the pleural space. The diagnosis of empyema usually requires a thoracentesis in order to sample the pleural fluid. Fluid that has frank pus, a high number of leukocytes, a glucose concentration less than 40 mg/dL, a pH less than 7.2, and/or a Gram stain showing bacterial organisms all support the diagnosis of empyema. Treatment with antibiotics alone results in clinical failure in almost all cases, thus recommended therapy involves the insertion of a chest tube. Traditionally these have been large bore chest tubes, although some physicians will insert smaller chest tubes to improve patient comfort. The infusion of tissue plasminogen activator and recombinant deoxyribonuclease into the pleural space through the chest tube in combination with intravenous antibiotic therapy targeting the implicated organism results in resolution of empyema in most cases. For patients in whom chest tube insertion fails to resolve the infection, video-assisted thoracoscopic surgery for decortication and drainage is typically required.

Incorrect Answers: A, B, D, and E.

Chylothorax (Choice A) is unlikely in this patient. Fluid analysis of chylothorax would show high levels of triglycerides, a milky white appearance, and a pH generally of 7.4 to 7.8.

Congestive heart failure (Choice B) is not the most likely cause in this patient. While she does have a history of mild congestive heart failure, her fluid analysis does not support this cause. Pleural effusions from congestive heart failure are of a transudative pattern. This patient has a pleural fluid protein level that is greater than 85% of her serum concentration, immediately ruling out a transudative cause.

Pulmonary embolism (Choice D) is unlikely in this patient. Pulmonary embolisms can cause pleural effusions and pulmonary edema through a transudative mechanism. This patient has a pleural fluid protein level that is greater than 85% of her serum concentration, immediately ruling out a transudative cause.

Tuberculosis (Choice E) is unlikely in this patient. In patients with pleural effusions as the result of tuberculosis, a pH greater than 7.3 would be expected. Additionally, this patient's chest x-ray does not detail any cavitory lesions, making tuberculosis less likely.

Educational Objective: An empyema is a bacterial infection of the pleural space that may develop as a complication of bacterial pneumonia. Diagnosis is made by examination of the pleural fluid, which commonly shows increased leukocytes, a pH less than 7.2, a low glucose concentration, and/or a Gram stain showing bacterial organisms. Treatment is with placement of a chest tube for drainage and intravenous antibiotics.



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- ✓ 3. A 37-year-old man is brought to the emergency department 12 hours after ingesting drain cleaner in a suicide attempt. On arrival, he is sitting up and drooling. He is unable to swallow because of intense throat pain. His pulse is 110/min, and blood pressure is 150/90 mm Hg. Examination shows erythema and edema of the oropharynx with some erosions of the soft palate. There is pain on palpation of the neck. The lungs are clear to auscultation. Cardiac examination shows a normal S₁ and S₂ without rubs, murmurs, or gallops. There is minimal epigastric tenderness, and bowel sounds are normal. An anteroposterior x-ray of the chest shows no abnormalities. Which of the following is the most appropriate initial step in management?
- ☐ A) Oral administration of activated charcoal in water
 - ☐ B) Oral administration of ipecac
 - ☐ C) Oral administration of magnesium citrate
 - ☒ D) Upper endoscopy
 - ☐ E) Gastric lavage

Correct Answer: D.

Drain cleaners are a common cause of caustic ingestion. They contain sodium and potassium hydroxides, which are alkali that are proton acceptors and strong nucleophiles. Alkali ingestion results in liquefactive necrosis and tissue injury with potential ulceration or rupture/perforation. Chemical burns and ulcerations of the tongue, airway, and esophagus may present with stridor, hoarseness, vomiting, and/or drooling. If severe, esophageal perforation can ensue, leading to free air in the mediastinum—known as Boerhaave syndrome—a surgical emergency. Treatment is initially focused on supportive measures including airway management and fluid resuscitation. Patients should be emergently evaluated with esophagoscopy (endoscopy) to assess for visceral injury and guide management.

Incorrect Answers: A, B, C, and E.

Oral administration of activated charcoal in water (Choice A) is indicated in many toxic ingestions when the ingestion occurs within 1 to 2 hours of administration time, and there is low risk for aspiration. Activated charcoal is contraindicated in cases of alkali ingestion due to its coating of necrotic mucosa, potential for extraluminal spread into the mediastinum, and limiting visibility on endoscopy. Additionally, any patient with a compromised airway (in this case, sitting upright and drooling/not handling secretions) should not receive medication by mouth until the airway is secure.



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Oral administration of activated charcoal in water (Choice A) is indicated in many toxic ingestions when the ingestion occurs within 1 to 2 hours of administration time, and there is low risk for aspiration. Activated charcoal is contraindicated in cases of alkali ingestion due to its coating of necrotic mucosa, potential for extraluminal spread into the mediastinum, and limiting visibility on endoscopy. Additionally, any patient with a compromised airway (in this case, sitting upright and drooling/not handling secretions) should not receive medication by mouth until the airway is secure.

Oral administration of ipecac (Choice B) is no longer recommended in management of toxic ingestions. Ipecac induces vomiting, which increases risk for aspiration. Repeat exposure of damaged esophageal and oral mucosa to ingested contents increases risk for esophagitis, ulceration, and perforation. Additionally, any patient with a compromised airway (in this case, sitting upright and drooling/not handling secretions) should not receive medication by mouth until the airway is secure.

Oral administration of magnesium citrate (Choice C) is indicated for constipation, as its primary role is as a laxative. It does not have a recognized use in the management of caustic ingestion. Additionally, any patient with a compromised airway (in this case, sitting upright and drooling/not handling secretions) should not receive medication by mouth until the airway is secure.

Gastric lavage (Choice E) is used in life-threatening cases that present within 1 hour of ingestion. It is only effective in cases where the toxin or ingested substance remains within the stomach. It is contraindicated in cases of a compromised airway or in cases where perforation of the gastrointestinal tract is possible, such as alkali ingestion.

Educational Objective: Drain cleaners contain caustic alkali that can cause burns and ulcerations of the tongue, airway, and esophagus, resulting in stridor, hoarseness, vomiting, and/or drooling. Esophagoscopy (endoscopy) should be emergently performed to evaluate the extent of visceral injury and guide management.



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- ✓ 4. A 27-year-old man comes for a routine health maintenance examination. He has had six episodes of acute pancreatitis over the past 8 years; his most recent episode occurred 3 months ago and resolved spontaneously. He has had recurrent episodes of abdominal pain since childhood. There is no history of abdominal trauma. He takes no medications and does not drink alcohol. Examination shows no hepatosplenomegaly or abdominal masses. There is no tenderness to palpation. Studies of the gallbladder and biliary tract show normal findings. Which of the following is most likely to confirm the diagnosis?
- ☐ A) Measurement of serum ionized calcium concentration
 - ☒ B) Measurement of serum triglyceride concentration
 - ☐ C) Assay for serum mumps antibody
 - ☐ D) CT scan of the abdomen
 - ☐ E) Examination of duodenal aspirate

Correct Answer: B.

This patient presents with a history of recurrent acute pancreatitis. Acute pancreatitis typically presents with epigastric abdominal pain that radiates to the back, along with nausea and emesis, often in a patient with a history of gallstones, alcohol use disorder, trauma, hypertriglyceridemia, or hypercalcemia. Acute pancreatitis can be complicated by necrosis, hemorrhage, abscess, or the formation of pseudocysts. Recurrent episodes of acute pancreatitis may lead to chronic pancreatitis and insufficiency of both the exocrine and endocrine pancreas. Any modifiable inciting causes of pancreatitis (eg, gallstones, alcohol use disorder, hypertriglyceridemia, hypercalcemia) should be mitigated to delay disease progression and preserve remaining native pancreatic function. This patient should receive measurement of serum triglycerides, as many other causes of pancreatitis have already been excluded in his case. Once confirmed, the first line class of medications to target hypertriglyceridemia in absence of concomitant hypercholesterolemia (eg, increased serum LDL cholesterol) is fibric acid derivatives. For example, gemfibrozil is a fibrate-based lipid-lowering agent that activates peroxisome proliferator-activated receptors and upregulates lipoprotein lipase, resulting in decreased serum LDL, increased HDL, and decreased triglyceride concentrations.

Incorrect Answers: A, C, D, and E.

Incorrect Answers: A, C, D, and E.

Measurement of serum ionized calcium concentration (Choice A) is appropriate in the evaluation of conditions that arise due to increased serum ionized calcium, or in the case of conditions that cause changes in ionized calcium. Hypercalcemia often presents with ostealgia, nephrolithiasis, abdominal pain, and psychiatric disturbances. Pancreatitis itself can cause hypocalcemia, as calcium deposits in the inflamed tissue of the organ. In this case, the patient is not currently symptomatic and serum calcium concentration would likely be within normal range in absence of co-presenting pancreatitis or symptoms of calcium derangements.

Assay for serum mumps antibody (Choice C) would be appropriate if signs or symptoms of mumps were present. Mumps virus presents with respiratory symptoms and lymphadenopathy, along with orchitis. It can be associated with pancreatitis, but in a young, healthy patient without other symptoms who has likely been vaccinated against it, it is not a likely explanation for recurrent pancreatitis.

CT scan of the abdomen (Choice D) would be appropriate in the evaluation of acute pancreatitis to assess for pancreatic inflammation or complications such as necrosis, abscess, or pseudocyst, or in the evaluation of competing causes of abdominal pain. This patient has a clinical picture consistent with recurrent pancreatitis and no evidence of any current complication or competing diagnosis.

Examination of duodenal aspirate (Choice E) is used primarily to assess for small intestinal bacterial overgrowth or infections such as giardiasis. It is not the first line in assessing pancreatitis, its causes, or its consequences as it is invasive and diagnostically appropriate techniques exist without the need for endoscopic retrieval of duodenal fluid.

Educational Objective: Acute pancreatitis typically presents with epigastric abdominal pain that radiates to the back, along with nausea and emesis, often in a patient with a history of gallstones, alcohol use disorder, trauma, hypertriglyceridemia, or hypercalcemia. Risk factors should be addressed and treated to prevent recurrence of symptoms and limit the likelihood of progression to chronic pancreatitis. Hypertriglyceridemia is best treated with fibric acid derivatives as first-line agents.



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- ✓ 5. A 4-year-old boy is diagnosed with acute lymphocytic leukemia. Although his parents are told that chemotherapy could increase his chance of survival by 80%, they state that they wish to treat the boy with herbal therapy. Which of the following is the most appropriate course of action?
- ☐ A) Allow the boy to be treated with herbal therapy
 - ☐ B) Obtain consent from the patient's grandparents
 - ☐ C) Transfer the patient to another hospital
 - ☒ D) Obtain a court order to treat the patient with chemotherapy
 - ☐ E) Begin treatment with chemotherapy without the parents' consent while obtaining a court order

Correct Answer: D.

Minors (patients younger than 18 years) may be evaluated and treated for life-threatening conditions. Though parental consent is required for most medical care, exceptions include medical care related to sex (eg, sexually transmitted infections, contraception, pregnancy care), substance use, and life-threatening medical or psychiatric conditions. If there is a possibility the patient possesses a life-threatening condition (eg, cancer in this patient), the physician can legally evaluate and treat the patient without parental consent. A court order is needed to override parental preferences in cases beyond immediately life-threatening emergencies. The physician in this case should obtain a court order to treat the patient over his parents' objections. However, if the patient does not possess a life-threatening condition, the physician should respect the parents' wishes. In cases where the parents cannot be reached, treatment should be delayed until the parents can be consulted. As well, emancipated minors may make their own medical decisions.

Incorrect Answers: A, B, C, and E.

Allow the boy to be treated with herbal therapy (Choice A) violates the ethical principles of beneficence and nonmaleficence, as this patient could lose his life as a result of withholding evidence-based cancer treatment.

Obtain consent from the patient's grandparents (Choice B) is not indicated. In most states, physicians may appeal to courts or state government child protection agencies to provide life-saving treatment that parents are refusing.



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Obtain consent from the patient's grandparents (Choice B) is not indicated. In most states, physicians may appeal to courts or state government child protection agencies to provide life-saving treatment that parents are refusing.

Transfer the patient to another hospital (Choice C) would inappropriately avoid the problem at hand, which is the parents' refusal of life-saving treatment.

Begin treatment with chemotherapy without the parents' consent while obtaining a court order (Choice E) is illegal. A court order is needed to override parental preferences in cases beyond immediately life-threatening emergencies.

Educational Objective: Parental consent is not required for evaluation or treatment of minors (patients younger than 18 years) when medical care is related to sex (eg, sexually transmitted infections, contraception, pregnancy care), substance use, and life-threatening medical or psychiatric conditions. A court order is needed to override parental preferences in cases beyond immediately life-threatening emergencies.



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6. A previously healthy 52-year-old man comes to the physician because of a 6-month history of weakness in his right hand and legs and a 2-month history of mild neck pain. He drinks six beers daily. Examination shows marked atrophy of the hands, worse on the right than on the left, and lower extremities. There are fasciculations of the right upper extremity. Deep tendon reflexes are 4+ in the upper and lower extremities. Babinski sign is present bilaterally. Which of the following is the most likely diagnosis?

- ☐ A) Alcoholic polyneuropathy
- ☒ B) Amyotrophic lateral sclerosis
- ☐ C) Cervical spondylosis
- ☐ D) Myasthenia gravis
- ☐ E) Vitamin B₁₂ (cobalamin) deficiency

Correct Answer: B.

Amyotrophic lateral sclerosis (ALS) is a progressive neurodegenerative disorder, typically starting in midlife, that affects both lower motor neurons arising from the anterior horn and upper motor neurons of the lateral corticospinal tract within the brain and spinal cord. Neuron degeneration results from an unknown etiology that may involve RNA processing and/or excitotoxicity. Patient presentations are variable, though typically feature a combination of findings from the upper motor neurons (eg, increased muscle tone, hyperreflexia, Babinski sign) and lower motor neurons (eg, decreased muscle tone, hyporeflexia, early muscle atrophy) in an asymmetric distribution, as in this patient, that may include the bulbar muscles. Some patients may experience cognitive or behavioral changes. The diagnosis is primarily clinical but may be supported by electromyographic findings of acute and chronic denervation. ALS is a terminal illness, with death usually occurring within 3 to 5 years following diagnosis, most commonly secondary to neuromuscular respiratory failure.

Incorrect Answers: A, C, D, and E.

Alcoholic polyneuropathy (Choice A) presents with a primary sensory neuropathy that starts in the feet and progresses proximally. This patient presents with motor symptoms, not sensory symptoms.



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Cervical spondylosis (Choice C) refers to degenerative changes of the cervical spine, which may lead to cervical spinal stenosis. Cervical spinal stenosis presents with symptoms of cervical radiculopathy, including pain that radiates to the arms, numbness, paresthesia, and/or weakness. This patient does not report numbness or paresthesia.

Myasthenia gravis (Choice D) is an autoimmune disorder of the neuromuscular junction that commonly presents with ptosis, diplopia, dysphagia, and muscle weakness, which are worse with repetitive activity and later in the day. Patients do not typically show upper or lower motor neuron signs. As well, this patient does not show diurnal symptom variation.

Vitamin B₁₂ (cobalamin) deficiency (Choice E) may present with subacute combined degeneration, which causes a combination of motor and sensory symptoms including ataxic gait, muscle weakness, paresthesia, and loss of proprioception and vibration sense. This patient shows motor symptoms only.

Educational Objective: Amyotrophic lateral sclerosis typically features a combination of upper motor neuron (eg, increased muscle tone, hyperreflexia, Babinski sign) and lower motor neuron findings (eg, decreased muscle tone, hyporeflexia, early muscle atrophy) in an asymmetric distribution that may include the bulbar muscles. It does not commonly cause sensory symptoms.



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7. A healthy 27-year-old woman comes to the physician requesting a PPD skin test. She works as a clerk at a physician's office and is concerned about tuberculosis even though she has no known exposure. Examination shows no abnormalities. A PPD skin test produces 19 mm of erythema and 8 mm of induration at 48 hours. Which of the following is the most appropriate next step in management?

- ☒ A) Reassurance and annual PPD skin test
- ☐ B) Reassurance and second PPD skin test only if exposure occurs
- ☐ C) Second PPD skin test in 1 week
- ☐ D) X-ray of the chest only
- ☐ E) X-ray of the chest and isoniazid therapy
- ☐ F) X-ray of the chest and rifampin therapy

Correct Answer: A.

The PPD, or tuberculin, skin test is considered positive at varying sizes of induration based on the population in which the test is done. Patients with HIV and other conditions that cause immunosuppression are considered to have a positive PPD test if the induration is measured at 5 mm or greater. By contrast, the general population is considered to have a positive PPD test if the induration is 15 mm or greater. Health care workers or those who work with high-risk populations are considered to have a positive PPD test result warranting treatment at 10 mm of induration. Notably, induration is what is measured, not erythema. This patient has a negative PPD test and should be reassured and assessed at an appropriate interval.

Incorrect Answers: B, C, D, E, and F.

Reassurance and second PPD skin test only if exposure occurs (Choice B) is incorrect. Health care workers are at risk for contracting tuberculosis, which is often minimally symptomatic in immunocompetent persons. Routine screening is appropriate. Additionally, this patient may not know if an exposure has occurred, as many patients with tuberculosis may be unaware that they have the condition until the time of diagnosis.

Second PPD skin test in 1 week (Choice C) is incorrect. For this patient, an annual screening interval is considered appropriate for tuberculosis. Repeating a test could be

- ☐ D) X-ray of the chest only
- ☐ E) X-ray of the chest and isoniazid therapy
- ☐ F) X-ray of the chest and rifampin therapy

Correct Answer: A.

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Incorrect Answers: B, C, D, E, and F.

Reassurance and second PPD skin test only if exposure occurs (Choice B) is incorrect. Health care workers are at risk for contracting tuberculosis, which is often minimally symptomatic in immunocompetent persons. Routine screening is appropriate. Additionally, this patient may not know if an exposure has occurred, as many patients with tuberculosis may be unaware that they have the condition until the time of diagnosis.

Second PPD skin test in 1 week (Choice C) is incorrect. For this patient, an annual screening interval is considered appropriate for tuberculosis. Repeating a test could be appropriate if a physician had high clinical suspicion for a diagnosis despite initially normal testing.

X-ray of the chest only (Choice D), x-ray of the chest and isoniazid therapy (Choice E), and x-ray of the chest and rifampin therapy (Choice F) could be appropriate in cases of a positive test. Positive tests should be followed by an x-ray of the chest to assess for active tubercular disease, followed by treatment of either active or latent infection depending on results. As of 2023, recommendations for treatment of latent tuberculosis include a course of rifamycin-based therapy.

Educational Objective: Health care workers or those who work with high-risk populations are considered to have a positive PPD skin test result warranting treatment at 10 mm of induration. Induration is what is measured, not erythema.



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- ✓ 8. A 47-year-old man comes to the physician 24 hours after the onset of fever and nausea. He has a 4-week history of diarrhea that has increased in volume and frequency. The diarrhea has not responded to use of over-the-counter medications, and he now passes watery brown stools 8 to 10 times daily. During the past 5 days, he has had mild abdominal cramps that are relieved by bowel movements. Prior to the onset of his symptoms, he went on a 2-week vacation to Mexico and took ciprofloxacin daily. He has not had fecal incontinence or any other symptoms. He has no history of serious illness. His temperature is 38.6°C (101.5°F), pulse is 86/min, and blood pressure is 130/80 mm Hg. The abdomen is soft. There is right upper quadrant tenderness with no rebound tenderness. Bowel sounds are increased in all quadrants. The liver is tender and enlarged. Rectal examination shows no abnormalities. Test of the stool for occult blood is positive. Laboratory studies show:

Hemoglobin	9.8 g/dL
Leukocyte count	17,200/mm ³
Serum	
Total bilirubin	3.8 mg/dL
Alkaline phosphatase	279 U/L
AST	96 U/L
ALT	84 U/L

Examination of the stool shows leukocytes. Test of the stool for *Clostridium difficile* toxin is negative. A CT scan of the abdomen shows an 8-cm cystic mass in the right lobe of the liver. Which of the following is the most likely explanation for this patient's CT scan findings?

- ☐ A) Echinococcal infection
- ☒ B) *Entamoeba histolytica* infection
- ☐ C) *Giardia lamblia* infection
- ☐ D) Liver fluke infection
- ☐ E) *Streptococcus milleri* infection



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☐ E) *Streptococcus milleri* infection

Correct Answer: B.

Infection with *Entamoeba histolytica* leads to amoebiasis (amoebic dysentery). *E. histolytica* is an amoebic parasite and forms cysts that can be transmitted through the fecal-oral route and through ingestion of contaminated water. Amoebic cysts mature to trophozoites in the large bowel. Trophozoites may invade the colonic mucosa and interstitium, leading to symptoms of abdominal pain and bloody diarrhea. Invasive infections can lead to colonic perforation and sepsis. If trophozoites enter the bloodstream, they may travel to the liver and cause hepatic amoebic abscesses, which present with fever and right upper quadrant pain. This patient's CT scan showing an 8-cm cystic mass is likely an amoebic abscess secondary to liver invasion by *E. histolytica*. Diagnosis can be made with identification of cysts on stool microscopy or peripheral blood smear, which may show trophozoites with endosomes containing red blood cells, as well as by antibody assay or polymerase chain reaction test. Colonoscopy shows mucosal ulcers that are often flask-shaped. Treatment requires combination therapy with metronidazole or tinidazole as well as an anti-luminal agent such as paromomycin or iodoquinol.

Incorrect Answers: A, C, D, and E.

Echinococcal infection (Choice A) is a parasitic infection that can also cause hepatic cysts. However, it does not typically cause diarrhea. Echinococcal infections are usually asymptomatic until cysts grow during the course of several years to cause pain, nausea, and vomiting. Similarly, liver fluke infection (Choice D) is typically asymptomatic for many years but similarly affects the liver, biliary ducts, and gallbladder. While some infections can cause diarrhea, it does not usually cause hepatic cysts such as those with *E. histolytica*.

Giardia lamblia (Choice C) is a parasitic organism that causes giardiasis. Light microscopy shows a pear-shaped, binucleate, flagellated trophozoite. Parasitic overgrowth of the small bowel leads to intestinal malabsorption. While the diarrhea associated with giardiasis may occasionally be bloody, this symptom is less frequently observed than malabsorption. Diarrhea is typically nonbloody, foul-smelling, and greasy. *G. lamblia* does not cause hepatic cysts.

Streptococcus milleri (Choice E) has been shown to cause hepatic abscesses. However, it is not typically associated with diarrhea or traveler's diarrhea.

Educational Objective: *Entamoeba histolytica* is an amoebic parasite that causes intestinal amoebiasis, which presents with abdominal pain and bloody diarrhea. Extracolonic invasion of the bloodstream may occur, leading to the formation of hepatic abscesses that present with fever and right upper quadrant pain. Treatment requires combination therapy with metronidazole or tinidazole along with an anti-luminal agent such as paromomycin or iodoquinol.



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Pause

- ✓ 9. A 16-year-old girl is brought to the emergency department 6 hours after the onset of moderate lower abdominal cramps and intermittent nausea. She has not vomited during this time. She says that her last menstrual period was 2 months ago, but she has had intermittent bleeding since then, including spotting for the past 2 days. Menarche was at the age of 15 years. Menses occur at irregular 25- to 45-day intervals. She is sexually active and uses condoms inconsistently. Her temperature is 38.1°C (100.6°F), pulse is 94/min, respirations are 22/min, and blood pressure is 120/80 mm Hg. Examination shows a soft abdomen with lower quadrant tenderness, especially on the right. Bowel sounds are normal. Which of the following is the most appropriate next step in management?
- ☐ A) Complete blood count
 - ☐ B) Urinalysis
 - ☐ C) Abdominal x-ray
 - ☒ D) Pelvic examination
 - ☐ E) Exploratory laparoscopy

Correct Answer: D.

Acute abdominopelvic pain or cramping in a female patient of childbearing age should raise suspicion for a variety of gynecologic pathologies such as ovarian torsion, ectopic pregnancy, pelvic inflammatory disease, and ruptured ovarian cyst, in addition to gastrointestinal, vascular, and urological differential diagnoses. This patient's inconsistent use of condoms and last menstrual period being 2 months ago raises suspicion of current pregnancy, with concern for possible ectopic pregnancy given her presenting localized symptoms on examination. The most appropriate initial step in management is to perform a thorough pelvic examination. This will help differentiate causes of her symptoms. Following pelvic examination, combined transabdominal/transvaginal ultrasonography would be the next best step to further elucidate the cause of this patient's symptoms, as the female pelvic and reproductive anatomy is best visualized on ultrasonography.

Incorrect Answers: A, B, C, and E.

Complete blood count (Choice A) would assist in the evaluation of alterations in hemoglobin, leukocyte count, or platelet count. This patient is presenting with abdominal cramping and localized tenderness on examination. While she may have alteration in these values, especially if pregnant, this would not assist in the urgent diagnosis of her possible ectopic pregnancy.

Acute abdominopelvic pain or cramping in a female patient of childbearing age should raise suspicion for a variety of gynecologic pathologies such as ovarian torsion, ectopic pregnancy, pelvic inflammatory disease, and ruptured ovarian cyst, in addition to gastrointestinal, vascular, and urological differential diagnoses. This patient's inconsistent use of condoms and last menstrual period being 2 months ago raises suspicion of current pregnancy, with concern for possible ectopic pregnancy given her presenting localized symptoms on examination. The most appropriate initial step in management is to perform a thorough pelvic examination. This will help differentiate causes of her symptoms. Following pelvic examination, combined transabdominal/transvaginal ultrasonography would be the next best step to further elucidate the cause of this patient's symptoms, as the female pelvic and reproductive anatomy is best visualized on ultrasonography.

Incorrect Answers: A, B, C, and E.

Complete blood count (Choice A) would assist in the evaluation of alterations in hemoglobin, leukocyte count, or platelet count. This patient is presenting with abdominal cramping and localized tenderness on examination. While she may have alteration in these values, especially if pregnant, this would not assist in the urgent diagnosis of her possible ectopic pregnancy.

Urinalysis (Choice B) would assist in the diagnosis of a urinary tract infection. However, while this patient presents with lower abdominal cramping, she does not have other symptoms of a urinary tract infection such as dysuria and/or frequent urination. As well, she shows localized tenderness on examination, which does not correlate anatomically with the location of the urinary bladder.

Abdominal x-ray (Choice C) can be used to evaluate for a variety of intra-abdominal pathologies. It is most used for the assessment of possible small bowel obstruction or adynamic ileus. X-rays are inadequate for the assessment of gynecologic or obstetric pathologies, and the radiation of an x-ray should be avoided, if possible, in a pregnant patient.

Exploratory laparoscopy (Choice E) is not appropriate for this patient presenting with pain and localized tenderness on examination, with stable vital signs. In the setting of a ruptured ectopic pregnancy, this may be necessary for treatment. While this patient presents with symptoms of a possible ectopic pregnancy, there is no definitive evidence of a rupture or instability to indicate an exploratory laparoscopy at this time.

Educational Objective: Acute abdominopelvic pain or cramping in a female patient of childbearing age should raise suspicion for a variety of gynecologic pathologies such as ovarian torsion, ectopic pregnancy, pelvic inflammatory disease, and ruptured ovarian cyst, in addition to gastrointestinal, vascular, and urological differential diagnoses. A thorough pelvic examination is the best first step in evaluating the patient, followed by pelvic ultrasonography to further elucidate any potential underlying gynecologic or obstetric pathology.



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✓ 10. A 52-year-old woman, gravida 2, para 2, comes to the physician because of a 10-month history of severe hot flashes and difficulty sleeping. Menses occur at 3- to 4-month intervals. Menses previously occurred at regular 28-day intervals. Her only medication is lorazepam for generalized anxiety disorder. Examination, including pelvic examination, shows no abnormalities. The uterus is normal. Which of the following is the most appropriate next step in management?

- ☒ A) Oral estrogen and progesterone therapy
- ☐ B) Oral estrogen therapy only
- ☐ C) Oral progesterone therapy only
- ☐ D) Use of an estrogen ring
- ☐ E) Intrauterine progesterone therapy

Correct Answer: A.

Menopause refers to the absence of menstruation for 1 year due to a diminution in ovarian reserve. On average, it begins around 50 years of age. Symptoms include hot flashes, night sweats, and vaginal atrophy or dryness. Mood and sleeping patterns may be affected. While it is commonly a clinical diagnosis, laboratory studies will show an increased follicle-stimulating hormone and decreased estradiol concentration. As symptoms of menopause are secondary to estrogen deficiency, which can also increase the risk for a variety of other health problems, such as osteoporosis, hormone therapy with supplemental estrogen is often considered. While estrogen therapy does relieve symptoms, it is not without risk. Prolonged exposure to unopposed estrogen can increase the risk for endometrial cancer, cardiovascular disease, thromboembolism, and breast cancer. To minimize the deleterious effects of estrogen therapy, specifically the risk for endometrial cancer, it is often administered in combination with progesterone. The recommended duration of use is limited to 3 to 5 years for these reasons.

Incorrect Answers: B, C, D, and E.

Oral estrogen therapy only (Choice B) is not recommended because of its increased risk for endometrial hyperplasia and cancer if administered without progesterone. This patient should receive combination therapy to avoid this unnecessary risk.



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Correct Answer: A.

Menopause refers to the absence of menstruation for 1 year due to a diminution in ovarian reserve. On average, it begins around 50 years of age. Symptoms include hot flashes, night sweats, and vaginal atrophy or dryness. Mood and sleeping patterns may be affected. While it is commonly a clinical diagnosis, laboratory studies will show an increased follicle-stimulating hormone and decreased estradiol concentration. As symptoms of menopause are secondary to estrogen deficiency, which can also increase the risk for a variety of other health problems, such as osteoporosis, hormone therapy with supplemental estrogen is often considered. While estrogen therapy does relieve symptoms, it is not without risk. Prolonged exposure to unopposed estrogen can increase the risk for endometrial cancer, cardiovascular disease, thromboembolism, and breast cancer. To minimize the deleterious effects of estrogen therapy, specifically the risk for endometrial cancer, it is often administered in combination with progesterone. The recommended duration of use is limited to 3 to 5 years for these reasons.

Incorrect Answers: B, C, D, and E.

Oral estrogen therapy only (Choice B) is not recommended because of its increased risk for endometrial hyperplasia and cancer if administered without progesterone. This patient should receive combination therapy to avoid this unnecessary risk.

Oral progesterone therapy only (Choice C) would not adequately improve this patient's menopausal symptoms. Rather, combination therapy should be administered with both estrogen and progesterone to appropriately treat her symptoms and avoid endometrial adverse effects.

Use of an estrogen ring (Choice D) refers to an endovaginal ring that continuously releases estrogen over 3 months to treat menopausal changes in and around the vagina such as vaginal atrophy. This would not help improve this patient's extravaginal menopausal symptoms. This has a decreased risk for endometrial hyperplasia and cancer, although patients should still be monitored closely for any signs of abnormal uterine bleeding.

Intrauterine progesterone therapy (Choice E) would not help this patient's symptoms of menopause such as hot flashes. It is not indicated for this patient.

Educational Objective: Menopause refers to the absence of menstruation for 1 year due to a diminution in ovarian reserve. On average, it begins around 50 years of age. While estrogen therapy does relieve symptoms, it is not without risk. Prolonged exposure to unopposed estrogen can increase the risk for endometrial cancer, cardiovascular disease, thromboembolism, and breast cancer. To minimize the deleterious effects of estrogen therapy, specifically the risk for endometrial cancer, it is often administered in combination with progesterone.



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Pause

- ✓ 11. Two days after operative repair of a right hip fracture, an 82-year-old woman is somnolent. Her initial postoperative course was uncomplicated. She has a 10-year history of osteoporosis. Her current medications are enoxaparin, morphine, and temazepam. She has never smoked cigarettes. Prior to the hip fracture, she was able to walk short distances with a walker. She is 157 cm (5 ft 2 in) tall and weighs 54 kg (120 lb); BMI is 22 kg/m². She responds to painful stimuli only. Her temperature is 37.2°C (99°F), pulse is 88/min and regular, respirations are 10/min, and blood pressure is 132/82 mm Hg. There are jugular venous pulsations 4 cm above the sternal angle. Examination shows severe kyphoscoliosis. The lungs are clear to auscultation. Examination of the right lower extremity shows ecchymoses and edema of the proximal thigh; there is trace ankle edema and **no palpable cord**. Examination of the left lower extremity shows no edema or palpable cord. Arterial blood gas analysis on room air shows:

pH	7.27
Pco ₂	58 mm Hg
Po ₂	60 mm Hg
HCO ₃ ⁻	26 mEq/L
O ₂ saturation	88%

An x-ray of the chest shows a normal cardiac silhouette, no pleural effusions, and a **small area of atelectasis at the right lung base**. An ECG shows a normal sinus rhythm and no ischemic changes. Which of the following is the most appropriate pharmacotherapy?

- ☐ A) Intravenous furosemide
- ☐ B) Intravenous heparin
- ☒ C) Intravenous naloxone
- ☐ D) Intravenous piperacillin-tazobactam
- ☐ E) Intravenous tissue plasminogen activator
- ☐ F) Nebulized albuterol

Correct Answer: C

Correct Answer: C.

Drug-induced hypoventilation is a serious respiratory complication caused by various medications affecting the central nervous system's respiratory centers or neuromuscular junctions. Sedative-hypnotics such as benzodiazepines, opioids, and barbiturates are common culprits, suppressing the brain's respiratory drive and impairing the response to CO₂ concentrations. Additionally, muscle relaxants and anesthetics can disrupt neuromuscular transmission, leading to respiratory muscle weakness and hypoventilation. Clinically, patients may present with symptoms ranging from mild respiratory depression to profound hypoventilation, including shallow breathing, oxygen desaturation, and ultimately respiratory failure. Management involves prompt identification of the offending agent, supportive measures such as supplemental oxygen and ventilatory support, and reversal agents when available, such as naloxone for opioid-induced respiratory depression. Close monitoring of respiratory function and vital signs is essential to prevent complications and ensure timely intervention in patients at risk for drug-induced hypoventilation.

Incorrect Answers: A, B, D, E, and F.

Intravenous furosemide (Choice A) is indicated for volume overload states and is commonly used in the treatment of heart failure exacerbations and valvulopathy. However, in this patient recovering from surgical repair of a hip fracture 2 days prior, drug-induced respiratory suppression is more likely.

Intravenous heparin (Choice B) is used to treat thrombotic states such as myocardial infarction and thromboembolic disease (eg, deep venous thrombosis and pulmonary embolism). These patients would be expected to be tachypneic, unlike what is seen in this patient. Intravenous heparin does not have an immediate role in the management of drug-induced hypoventilation.

Intravenous piperacillin-tazobactam (Choice D) is used in the treatment of a variety of infections, such as pneumonia or intra-abdominal infections. This patient has no other signs of infection, making antibiotic therapy unnecessary.

Intravenous tissue plasminogen activator (Choice E) would not be appropriate in treating this patient and is used for treatment of acute ischemic stroke or massive pulmonary embolism causing hemodynamic instability. Pulmonary embolism typically presents with pleuritic chest pain, tachycardia, hypoxia, tachypnea, hemoptysis, or syncope, and chest x-rays generally show no abnormalities.

Nebulized albuterol (Choice F) would be indicated to treat asthma or chronic obstructive pulmonary disease exacerbation. In either exacerbation, diffuse expiratory wheezes would be heard on examination, which is not present in this patient.

Educational Objective: Drug-induced hypoventilation arises from medications such as sedatives, opioids, and muscle relaxants, compromising respiratory drive or



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✓ 12. A 30-month-old boy is brought to the emergency department by his parents because of progressive difficulty bearing weight on his left leg. He now refuses to walk. His parents say that he used to walk with no problems. During the past week, he had two nosebleeds and required direct pressure for 20 minutes before they stopped. He was born at 38 weeks' gestation after an uncomplicated pregnancy and vaginal delivery. He was 51 cm (20 in) long at birth and weighed 2495 g (5 lb 8 oz). There is no personal or family history of serious illness. Immunizations are up-to-date. On arrival, he appears listless. His temperature is 39.5°C (103.1°F). Examination shows several large blue ecchymoses over the back and abdomen. The patient cries vigorously when the physician attempts to move the patient's left lower extremity. The neck is supple. The lungs are clear to auscultation. The spleen tip is palpated. The remainder of the examination shows no abnormalities. Laboratory studies show:

Hemoglobin	5.5 g/dL
Leukocyte count	45,000/mm ³
Segmented neutrophils	6%
Lymphocytes	92%
Blast cells	2%
Platelet count	40,000/mm ³
Erythrocyte sedimentation rate	150 mm/h

AP and lateral x-rays of the pelvis and left lower extremity show a permeative osteolytic lesion at the diaphysis of the proximal femur. Which of the following is the most appropriate next step in management?

- ☐ A) Radiolabeled leukocyte scan
- ☐ B) Technetium Tc 99m bone scan
- ☐ C) MRI of the pelvis and lower extremities
- ☒ D) Bone marrow biopsy
- ☐ E) Open surgical drainage of the left hip joint

- ☐ C) MRI of the pelvis and lower extremities
- ☒ D) Bone marrow biopsy
- ☐ E) Open surgical drainage of the left hip joint

Correct Answer: D.

Leukemia may arise from the lymphoid or myeloid cell lines. Acute lymphocytic leukemia is composed of lymphoid progenitor cells; it is the most common hematologic malignancy of childhood. Patients can present with various symptoms including hepatomegaly and/or splenomegaly, lymphadenopathy, fever, hematologic abnormalities, and musculoskeletal pain. The diagnosis can be made from biopsy of the bone marrow, lymph nodes, or other involved tissues. The most appropriate next step in management in this patient presenting with anemia, increased leukocyte count, and osteolytic lesion, is bone marrow biopsy to confirm the diagnosis.

Incorrect Answers: A, B, C, and E.

A radiolabeled leukocyte scan (Choice A) may be used to help identify areas of inflammation or infection when other imaging modalities are inconclusive or contraindicated. Bone marrow biopsy would be the most appropriate next step in management for this patient.

Technetium Tc 99m bone scan (Choice B) may be used to evaluate for the presence of osteoblastic osseous metastases, commonly in the setting of breast and prostate cancer. It can also be used for the evaluation of osteomyelitis.

MRI of the pelvis and lower extremities (Choice C) is not the most appropriate next diagnostic step for this patient. Bone marrow biopsy would be more appropriate as the patient has many symptoms suggestive of malignancy.

Open surgical drainage of the left hip joint (Choice E) may be appropriate in cases of infection. However, this patient was identified to have an osteolytic lesion. In combination with the patient's other symptoms, malignancy should be considered. Bone marrow biopsy would be the most appropriate next step in management.

Educational Objective: Acute lymphocytic leukemia is the most common hematologic malignancy of childhood. Presenting symptoms may include hepatomegaly and/or splenomegaly, lymphadenopathy, fever, hematologic abnormalities, and musculoskeletal pain. The diagnosis may be made from biopsy of lymph nodes, bone marrow, or other involved tissues.



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13. A previously healthy 47-year-old man comes to the physician because of progressive difficulty swallowing during the past 3 months. He reports that both solid foods and liquids seem to "get hung up" behind the lower part of his breast bone. He has had to take smaller bites, chew better, and eat more slowly than he has in the past. He has not had any change in weight. Physical examination shows no abnormalities. A barium swallow is shown. Which of the following is the most likely cause of this patient's symptoms?

- ☐ A) Esophageal diverticulum
- ☒ B) Esophageal sphincter dysfunction
- ☐ C) Foreign body ingestion
- ☐ D) Gastric bezoar
- ☐ E) Paraesophageal hernia



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This patient's symptoms are most likely caused by esophageal sphincter dysfunction, specifically esophageal achalasia. Achalasia is an esophageal dysmotility disorder resulting from deficient peristalsis as a result of impaired neuromuscular transmission and impaired relaxation of the lower esophageal sphincter (LES). It manifests as dysphagia, odynophagia, weight loss, halitosis, and regurgitation of undigested food. It is diagnosed with a barium swallow and esophageal manometry. Destruction of nerves in the myenteric plexus impairs local nitric oxide production, prevents smooth muscle relaxation, and disproportionately affects inhibitory neurons, which function to relax the LES. An increase in LES pressure and dysfunctional peristalsis cause gradual dilation of the esophagus with retention of food, leading to dysphagia and regurgitation. On barium swallow, achalasia classically appears as a dilated esophagus with distal taper. Treatment includes pneumatic dilation or injection of botulinum toxin to relax the LES.

Incorrect Answers: A, C, D, and E.

Esophageal diverticulum (Choice A) occurs within the hypopharynx, just above or at the level of the cricopharyngeus muscle. The mechanism of formation includes an uncoordinated swallowing mechanism, which results in muscle spasms of the cricopharyngeus leading to pulsion diverticula as the wall of the hypopharynx and superior esophagus weakens. Symptoms include halitosis, regurgitation of undigested food, and dysphagia. Barium swallow shows a posterior, midline outpouching above or at the level of the cricopharyngeus.

Foreign body ingestion (Choice C) is typically an acute process that can cause esophageal impaction and acute dysphagia, such as with a food bolus impaction. This patient's symptoms are chronic and a barium swallow does not show a foreign body, making this diagnosis unlikely.

Gastric bezoar (Choice D) is a space-occupying mass of indigestible matter, often hair or chewing gum. Occasionally, large-volume pill ingestion can lead to a pill bezoar. Because of the space-occupying nature of the lesion in the stomach, much smaller amounts of food can be consumed prior to feelings of satiety. If large enough, a bezoar can lead to a gastric outlet obstruction, which results in vomiting of undigested food with resultant weight loss from malnutrition.

Paraesophageal hernia (Choice E) is caused by a defect in the diaphragm at the esophageal hiatus that allows the LES and variable amounts of the stomach to be displaced into the thorax. It can cause heartburn, nausea or emesis, dysphagia, regurgitation, and shortness of breath. This patient's barium swallow shows a tapering at the distal end of the esophagus, rather than the appearance of the stomach in the thorax.



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- ✓ 14. A 42-year-old woman comes to the physician because of a 2-week history of nonradiating low back pain that she first noticed after doing some heavy lifting at work. She has not had numbness or weakness in her lower extremities or any bowel or bladder dysfunction. At the age of 12 years, she received the diagnosis of scoliosis; her condition was evaluated with periodic x-rays but did not require the use of a brace or operative repair. On examination, straight-leg raising is negative. Muscle strength is normal, and sensation is intact. Pedal pulses are 2+. Plain x-rays of the spine show a 15-degree curvature of the thoracic spine and mild degenerative changes of the lumbosacral spine. Which of the following is the most likely outcome of this patient's scoliosis?
- ☐ A) Continued progression of the curvature
 - ☐ B) Development of thoracic back pain
 - ☐ C) Development of dyspnea on exertion
 - ☐ D) Development of lower extremity paresthesias
 - ☒ E) No symptoms are likely to develop

Correct Answer: E.

Scoliosis is defined as a lateral curvature of the spine that is greater than 10 degrees. Scoliosis may occur idiopathically or may develop secondary to an underlying condition such as cerebral palsy, spina bifida, muscular dystrophy, or other congenital anomalies. A diagnosis of scoliosis is confirmed using x-rays, which allows for measurement of the scoliotic curvature known as the Cobb angle. Cases of mild idiopathic scoliosis, such as this patient's, with a Cobb angle of less than 30 degrees have a low chance of curve progression and subsequent symptom development.

Incorrect Answers: A, B, C, and D.

Continued progression of the curvature (Choice A) is not the most likely outcome in this case. There is a low rate of curve progression in cases of idiopathic scoliosis with a curvature of less than 30 degrees.



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Pause

- ✓ 15. An otherwise healthy 21-year-old woman is admitted to the hospital because of a ruptured ectopic pregnancy. In the emergency department, her pulse was 120/min, respirations were 20/min, and blood pressure was 90/70 mm Hg. After intravenous administration of 2 L of 0.9% saline, her blood pressure increases to 110/75 mm Hg. In the operating room, her hematocrit is 25%. Transfusion with packed red blood cells is begun, and general anesthesia is administered. As the skin is prepped for the operation, her blood pressure decreases to 65/30 mm Hg. Pulse oximetry on an FiO_2 of 0.40 shows an oxygen saturation of 75%. There is acute increased airway resistance to mechanical ventilation. The patient's blood pressure does not respond to 100% oxygen and 0.9% saline boluses. Two minutes later, her systolic blood pressure is 50 mm Hg. Her temperature is 38.2°C (100.8°F). Which of the following is the most likely diagnosis?
- ☐ A) Amniotic fluid embolism
 - ☒ B) Anaphylactic transfusion reaction
 - ☐ C) Malignant hyperthermia
 - ☐ D) Pelvic hemorrhage
 - ☐ E) Pulmonary aspiration

Correct Answer: B.

Transfusion reactions are common and can range in severity from mild discomfort (eg, itching, fever, mild rash) to life-threatening illness (eg, hemolysis, anaphylaxis). Life-threatening hemolytic transfusion reactions can occur from ABO incompatibility or in those with IgA deficiency. Patients with IgA deficiency are at an increased risk for anaphylaxis secondary to the intrinsic production of anti-IgA antibodies. Packed red blood cells, whole blood, platelets, and fresh frozen plasma among several other blood products contain IgA, thus transfusion of any of these products can potentially lead to anaphylaxis. When anaphylaxis is suspected, the transfusion should be halted immediately, and the patient treated and resuscitated accordingly. Clinical features include laryngeal edema with wheezing and/or stridor, hypotension, fever, and tachycardia. Epinephrine is the treatment of choice in cases of anaphylaxis.

Incorrect Answers: A, C, D, and E.

Amniotic fluid embolism (Choice A) is a rare and potentially fatal complication of childbirth caused by amniotic fluid entering the maternal circulation. While amniotic fluid embolism is more common in patients with abnormal placentation, including placenta previa, this complication remains rare. The patient's presenting symptoms are more



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Correct Answer: B.

Transfusion reactions are common and can range in severity from mild discomfort (eg, itching, fever, mild rash) to life-threatening illness (eg, hemolysis, anaphylaxis). Life-threatening hemolytic transfusion reactions can occur from ABO incompatibility or in those with IgA deficiency. Patients with IgA deficiency are at an increased risk for anaphylaxis secondary to the intrinsic production of anti-IgA antibodies. Packed red blood cells, whole blood, platelets, and fresh frozen plasma among several other blood products contain IgA, thus transfusion of any of these products can potentially lead to anaphylaxis. When anaphylaxis is suspected, the transfusion should be halted immediately, and the patient treated and resuscitated accordingly. Clinical features include laryngeal edema with wheezing and/or stridor, hypotension, fever, and tachycardia. Epinephrine is the treatment of choice in cases of anaphylaxis.

Incorrect Answers: A, C, D, and E.

Amniotic fluid embolism (Choice A) is a rare and potentially fatal complication of childbirth caused by amniotic fluid entering the maternal circulation. While amniotic fluid embolism is more common in patients with abnormal placentation, including placenta previa, this complication remains rare. The patient's presenting symptoms are more consistent with an anaphylactic transfusion reaction.

Malignant hyperthermia (Choice C) is caused by a genetic defect in the ryanodine receptor and presents with muscle rigidity, tachycardia, fever, lactic acidosis, and hypercarbia when the patient is exposed to succinylcholine or volatile anesthetics. Risk factors include a family history, being born in the upper Midwest of the United States, and certain musculoskeletal disorders. Dantrolene is the treatment of choice in cases of malignant hyperthermia.

Pelvic hemorrhage (Choice D) may be a possible cause of hypotension in cases of a ruptured ectopic pregnancy. However, the patient is also presenting with fever and increased airway pressure making an anaphylactic transfusion reaction more likely.

Pulmonary aspiration (Choice E) is not the most likely cause of the patient's clinical deterioration. Severe transfusion reaction is more likely because of the patient's increased airway pressure, fever, and worsening hypotension developing after administration of blood products.

Educational Objective: Transfusion reactions are common and can range in severity from mild discomfort to life-threatening illness. Anaphylaxis presents clinically with hypotension, nausea, vomiting, abdominal pain, and respiratory distress. It should be treated promptly with cessation of the transfusion, supportive therapy, and epinephrine.



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- ✓ 16. A 72-year-old man comes to the emergency department because of a 36-hour history of severe pain in his right thigh. He rates his pain as an 8 on a 10-point scale and describes it as deep, dull, and achy. The pain increases when he moves or bears weight on the right leg. Over-the-counter ibuprofen decreased the pain to a 6 on a 10-point scale. The patient has stage IV adenocarcinoma of the lung, chronic obstructive pulmonary disease, hypertension, peptic ulcer disease, and coronary artery disease. His medications are metoprolol and inhaled albuterol-ipratropium. On arrival, an intravenous bolus of morphine (2 mg) is administered. Thirty minutes later, the patient rates the pain as a 4. His temperature is 36.9°C (98.4°F), pulse is 72/min, respirations are 22/min, and blood pressure is 162/68 mm Hg. Bilateral end-expiratory wheezes are heard. There is tenderness to palpation over the anterior aspect of the right midthigh. His leukocyte count is 6800/mm³ with a normal differential. An x-ray of the right femur shows a midshaft lytic lesion. In addition to oral morphine, which of the following is the most appropriate next step in management?
- ☐ A) Physical therapy
 - ☐ B) Acupuncture
 - ☐ C) Gabapentin therapy
 - ☐ D) Tramadol therapy
 - ☒ E) Radiation therapy

Correct Answer: E.

In an emergency department (ED) setting, addressing pain in a patient with cancer metastatic to bone requires rapid assessment and intervention to help alleviate discomfort and uncover other underlying issues. The treatment of cancer pain is complex and often requires a multifaceted, ever-changing approach as the patient's disease continues to progress. Prompt initiation of analgesia with opioids, such as morphine or hydromorphone, is often necessary to achieve adequate pain relief. Adjunctive medications like NSAIDs, acetaminophen, or even ketamine may be used to enhance analgesia and manage neuropathic pain. Consideration should be given to the use of local anesthetics for regional nerve blocks or infiltration to provide acute, targeted pain relief for localized bone lesions or fractures. Collaboration with



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Correct Answer: E.

In an emergency department (ED) setting, addressing pain in a patient with cancer metastatic to bone requires rapid assessment and intervention to help alleviate discomfort and uncover other underlying issues. The treatment of cancer pain is complex and often requires a multifaceted, ever-changing approach as the patient's disease continues to progress. Prompt initiation of analgesia with opioids, such as morphine or hydromorphone, is often necessary to achieve adequate pain relief. Adjunctive medications like NSAIDs, acetaminophen, or even ketamine may be used to enhance analgesia and manage neuropathic pain. Consideration should be given to the use of local anesthetics for regional nerve blocks or infiltration to provide acute, targeted pain relief for localized bone lesions or fractures. Collaboration with oncology specialists or palliative care teams is essential for comprehensive pain management, including radiation therapies that are not readily available in the acute emergency setting, facilitating coordination of care, and ensuring continuity beyond the ED.

Incorrect Answers: A, B, C, and D.

Physical therapy (Choice A) would not be the next best step in the management of this patient. While physical therapy can be important in ensuring the maintenance of strength in patients with malignancy, the lytic bone lesion in this patient's femur poses a modest fracture risk. While this is not an absolute contraindication, it is not the next best step for this patient.

Acupuncture (Choice B) is not the most appropriate next step. Acupuncture has broad indications and can be used in the treatment of pain. However, given the obvious metastatic bone lesion, it is unlikely to provide significant relief and this patient would be best treated with radiation therapies.

Gabapentin therapy (Choice C) would not be the best next step for this patient. While gabapentin can be used in the treatment of neuropathic pain, pain from lytic bone lesions is generally not responsive to this modality. It is more appropriate to have the patient begin radiation therapies to target this specific area.

Tramadol therapy (Choice D) is not the most appropriate next step in management. While tramadol can be used for the treatment of mild to moderate levels of pain, this patient with a metastatic bone lesion is already requiring intravenous morphine and additionally will receive oral morphine to manage pain. Given that tramadol is a partial agonist to opioid receptors, this could decrease the efficacy of morphine, as they would be competing for the same receptors.

Educational Objective: In the emergency department, addressing pain in cancer patients with bone metastases generally requires opioid analgesia, adjunctive medication consideration, and collaboration with specialists for comprehensive management and consideration of other adjunctive treatments such as radiation therapy.



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- ✓ 17. A 57-year-old nulligravid woman comes to the physician for a routine health maintenance examination. Menses occur at irregular 28- to 42-day intervals. She has not had hot flashes. She has no history of serious illness or abnormal Pap smears, and she takes no medications. She is 157 cm (5 ft 2 in) tall and weighs 102 kg (225 lb); BMI is 41 kg/m². Physical examination, including pelvic examination, shows no abnormalities. Her serum fasting glucose concentration is 140 mg/dL. During the next 10 years, this patient is at increased risk for which of the following conditions?
- ☐ A) Cervical cancer
 - ☒ B) Endometrial cancer
 - ☐ C) Hyperthyroidism
 - ☐ D) Osteoporosis
 - ☐ E) Ovarian cancer

Correct Answer: B.

Risk factors for endometrial cancer include age older than 45 years, perimenopausal or postmenopausal status, nulliparity, a history of ovulatory dysfunction, diabetes mellitus, hypertension, obesity, and genetic factors. Many of these risk factors involve estrogen excess, which leads to endometrial proliferation. For example, excess adipose tissue increases aromatase concentrations, which convert circulating androgens to estrogens, and nulliparity leads to increased overall exposure to estrogens during menstrual cycles. Abnormal uterine bleeding (AUB) is a common presenting symptom of endometrial cancer. AUB is defined as bleeding that is abnormally heavy or frequent, irregular, unpredictable, or not associated with usual premenstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). In all patients with AUB who are older than 45 years or are younger and possess risk factors for endometrial cancer, endometrial biopsy should be performed to evaluate for endometrial cancer (after excluding pregnancy). This patient has many risk factors for development of endometrial cancer, including nulliparity, irregular menses (AUB), and increased BMI.

Incorrect Answers: A, C, D, and E.

Cervical cancer (Choice A) is more common in women who have human papillomavirus (HPV) infection, particularly the strains HPV-16 and HPV-18. A history of multiple sexual partners, tobacco use, and immunosuppression also put patients at increased risk.



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Correct Answer: B.

Risk factors for endometrial cancer include age older than 45 years, perimenopausal or postmenopausal status, nulliparity, a history of ovulatory dysfunction, diabetes mellitus, hypertension, obesity, and genetic factors. Many of these risk factors involve estrogen excess, which leads to endometrial proliferation. For example, excess adipose tissue increases aromatase concentrations, which convert circulating androgens to estrogens, and nulliparity leads to increased overall exposure to estrogens during menstrual cycles. Abnormal uterine bleeding (AUB) is a common presenting symptom of endometrial cancer. AUB is defined as bleeding that is abnormally heavy or frequent, irregular, unpredictable, or not associated with usual premenstrual signs and symptoms (eg, bloating, breast fullness, uterine cramps). In all patients with AUB who are older than 45 years or are younger and possess risk factors for endometrial cancer, endometrial biopsy should be performed to evaluate for endometrial cancer (after excluding pregnancy). This patient has many risk factors for development of endometrial cancer, including nulliparity, irregular menses (AUB), and increased BMI.

Incorrect Answers: A, C, D, and E.

Cervical cancer (Choice A) is more common in women who have human papillomavirus (HPV) infection, particularly the strains HPV-16 and HPV-18. A history of multiple sexual partners, tobacco use, and immunosuppression also put patients at increased risk.

Hyperthyroidism (Choice C) may occur as a result of a toxic multinodular goiter, a toxic thyroid adenoma, as the initial phase in thyroiditis, or as a result of Graves disease. This patient has no apparent risk factors for the development of hyperthyroidism.

Osteoporosis (Choice D) is a metabolic bone disease characterized by diffusely low bone density. This patient's obesity is slightly protective against the development of osteoporosis because of the increased estrogen production related to excess adipose tissue.

Ovarian cancer (Choice E) classically presents indolently in older patients who are postmenopausal with abdominal distention and weight loss. It is hypothesized that an increased number of ovulatory cycles during a patient's lifetime increases the likelihood of ovarian cancer, so factors leading to more ovulatory cycles such as early menarche, nulliparity, decreased fertility, delayed childbearing, and late menopause increase the risk for ovarian cancer. This patient is at risk for ovarian cancer due to nulliparity; however, obesity increases her risk for endometrial cancer.

Educational Objective: Risk factors for endometrial cancer include age older than 45 years, perimenopausal or postmenopausal status, nulliparity, a history of ovulatory dysfunction, diabetes mellitus, hypertension, obesity, and genetic factors.



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- ✓ 18. During the past 2 weeks, a 17-year-old boy with a 5-year history of type 1 diabetes mellitus has had episodes of severe hypoglycemia, confusion, and disorientation after playing basketball for 30 minutes after school. He has been advised to consume additional carbohydrates before playing but refuses because of his concern about high blood sugar. He is being treated with 20 U of NPH insulin and 10 U of insulin lispro before breakfast and 15 U of NPH insulin and 8 U of insulin lispro before dinner. Until recently, his blood glucose concentrations have been in the range of 100 mg/dL to 160 mg/dL before each meal. Which of the following is the most appropriate next step in management?
- ☐ A) Decrease physical activity
 - ☐ B) Administer glucagon
 - ☐ C) Administer glyburide
 - ☐ D) Administer metformin
 - ☐ E) Decrease dose of NPH insulin in the evening
 - ☒ F) Decrease dose of NPH insulin in the morning
 - ☐ G) Decrease dose of insulin lispro in the evening
 - ☐ H) Decrease dose of insulin lispro in the morning

Correct Answer: F.

NPH insulin works by mimicking the normal physiological secretion of insulin by the pancreas. On injection, the NPH insulin molecules begin to dissociate from the protamine and zinc complex. This gradual dissociation allows for a slower onset of action compared with regular or rapid-acting insulins. The duration of action of NPH insulin typically lasts between 12 to 24 hours, with peak activity occurring approximately 4 to 12 hours after administration. This extended duration makes it suitable for providing basal insulin coverage throughout the day and night, helping to control fasting blood glucose concentrations. Because of its intermediate-acting nature, NPH insulin is often used in combination with short-acting insulins or rapid-acting insulin analogs to provide both basal and prandial insulin coverage in patients with diabetes mellitus. Given that this patient only takes insulin twice daily, both basal and fast-acting doses, but his symptoms are occurring in the afternoon, it is most likely that the morning NPH is the cause for his hypoglycemia. Because of this, decreasing his dose of NPH insulin in the morning is most appropriate.



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morning NPH is the cause for his hypoglycemia. Because of this, decreasing his dose of NPH insulin in the morning is most appropriate.

Incorrect Answers: A, B, C, D, E, G, and H.

Decrease physical activity (Choice A) is not recommended. It is more appropriate for this patient to eat a pre-exercise snack or for the physician to decrease his insulin regimen, as in this case.

Administer glucagon (Choice B) is not the best next step. While glucagon can help to quickly increase this patient's glucose concentrations during times of hypoglycemia, it is far more appropriate to adjust his basal insulin regimen to avoid the episodes altogether.

Administer glyburide (Choice C) is inappropriate in this patient for two reasons. First, administration of glyburide will exacerbate, not ameliorate, episodes of hypoglycemia. Second, this patient has type 1 diabetes mellitus, meaning that he does not secrete insulin on his own, making glyburide inappropriate as it stimulates pancreatic insulin secretion.

Administer metformin (Choice D) is not correct. Administration of metformin would not help in the management of hypoglycemia and potentially could exacerbate the symptoms.

Decrease dose of NPH insulin in the evening (Choice E) is not the most appropriate next step. This patient's hypoglycemia is occurring in the afternoon while playing basketball. The duration of action for NPH insulin is generally 4 to 12 hours for peak, thus making adjustment of the evening insulin inappropriate.

Decrease dose of insulin lispro in the evening (Choice G) is not the most appropriate next step. This patient's hypoglycemia is occurring in the afternoon while playing basketball. Insulin lispro is a fast-acting insulin, and adjustment of evening dosing would have no effect on this patient's hypoglycemia episodes during the afternoon.

Decrease dose of insulin lispro in the morning (Choice H) is not the most appropriate next step. Insulin lispro is a fast-acting insulin, and adjustment of morning dosing would have minimal effect on episodes of hypoglycemia occurring in the afternoon.

Educational Objective: NPH insulin works by mimicking the normal physiological secretion of insulin by the pancreas. On injection, the NPH insulin molecules begin to dissociate from the protamine and zinc complex. This gradual dissociation allows for a slower onset of action compared with regular or rapid-acting insulins. The duration of action of NPH insulin typically lasts between 12 to 24 hours, with peak activity occurring approximately 4 to 12 hours after administration.



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19. An 8-month-old boy is brought to the physician because his parents are concerned about his development. They report that he had learned to stand with support at the age of 4 months but has been unable to stand with or without support during the past 2 weeks. During this period, he has cried when held around his chest. His parents add that he has not grown much during the past 2 months. He was born at term following an uncomplicated pregnancy and delivery. He receives no medications. His diet consists of breast milk, rice cereal, and pureed fruits. His family lives in a cold climate. At his last examination 2 months ago, he was at the 25th percentile for length and weight. Today, he is at the 3rd percentile for length and 10th percentile for weight. He is alert and mildly irritable. Vital signs are within normal limits. Examination shows a dark complexion. Cardiopulmonary examination shows no abnormalities. The abdomen is soft. The wrists are widened and tender. He screams when picked up and when placed in a standing position. X-rays of the right wrist and left knee are shown. Which of the following is the most likely diagnosis?
- ☐ A) Child abuse
 - ☐ B) Metaphyseal dysplasia
 - ☐ C) Osteogenesis imperfecta
 - ☐ D) Osteopetrosis
 - ☒ E) Rickets

Correct Answer: E.

The most common cause of rickets is due to a dietary deficiency in vitamin D as well as calcium. Rickets in children may present with bone pain and deformities such as bowing of the legs, bulging of costochondral junctions, and growth delay. An x-ray finding in rickets is widening of the wrist, which is seen in this case. Breastfed infants are recommended to have oral vitamin D supplementation because of the risk for vitamin D deficiency. The patient in this case has many risk factors for vitamin D deficiency including diet, dark complexion, and living in a cold environment.

Incorrect Answers: A, B, C, and D.

Correct Answer: E.

The most common cause of rickets is due to a dietary deficiency in vitamin D as well as calcium. Rickets in children may present with bone pain and deformities such as bowing of the legs, bulging of costochondral junctions, and growth delay. An x-ray finding in rickets is widening of the wrist, which is seen in this case. Breastfed infants are recommended to have oral vitamin D supplementation because of the risk for vitamin D deficiency. The patient in this case has many risk factors for vitamin D deficiency including diet, dark complexion, and living in a cold environment.

Incorrect Answers: A, B, C, and D.

Child abuse (Choice A) may be suspected when the injuries identified in a child do not match with the caretaker history. Red flags for child abuse include unexplained burns, multiple fractures in different stages of healing, and visceral injuries. This patient most likely has rickets.

Metaphyseal dysplasia (Choice B) may be caused by multiple different types of skeletal dysplasia. It is characterized by metaphyseal irregularities and may present with bowing of the lower extremities, which may be confused with rickets. This patient has multiple risk factors for vitamin D deficiency, making rickets the most likely diagnosis.

Osteogenesis imperfecta (Choice C) is caused by mutations in collagen genes, commonly *COL1A1* and *COL1A2*. These mutations cause decreased collagen synthesis and impaired bone matrix development leading to multiple fractures throughout life. A classic examination finding is thin, translucent sclera that appears blue due to the reflection of light from underlying choroidal veins. This patient most likely has rickets.

Osteopetrosis (Choice D) describes a disease of excessive mineralization of bone, leading to abnormally dense bone. It results from failure of osteoclastic resorption. The osteoclast arises from the monocyte-macrophage lineage; defects in signaling of macrophage colony-stimulating factor may play a role in the pathogenesis. This patient most likely has rickets.

Educational Objective: The most common cause of rickets is due to a dietary deficiency in vitamin D as well as calcium. Presenting symptoms may include bowing of the legs, bulging of costochondral junctions, and growth delay.



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✓ 20. A 47-year-old man comes to the emergency department because of fever during the past 8 hours. Two days ago, he sustained a small puncture wound to his lower abdomen while repairing a fence in a barnyard. He did not seek treatment at that time. He has a 10-year history of type 2 diabetes mellitus treated with glargine insulin. He appears lethargic. His temperature is 40°C (104°F), pulse is 130/min, and blood pressure is 90/60 mm Hg. Abdominal examination shows an exquisitely tender puncture wound over the right lower quadrant and surrounding erythema and warmth. During the next hour, the physician notices a 3-cm extension of the erythema. In addition to administration of intravenous fluids and broad-spectrum antibiotics, which of the following is the most appropriate next step in management?

- ☐ A) Hyperbaric oxygen therapy
- ☐ B) Tetanus immune globulin therapy
- ☐ C) Negative pressure wound therapy
- ☐ D) Incision and drainage with local anesthesia
- ☒ E) Surgical debridement under general anesthesia

Correct Answer: E.

Necrotizing soft tissue infections may present with erythema, edema, severe pain, fever, crepitus, and skin bullae, and they can progress rapidly. In this case, the patient sustained a small abdominal puncture wound with a history of type 2 diabetes mellitus, which increases his risk for developing a soft tissue infection. Treatment of necrotizing soft tissue infections consists of early surgical exploration and debridement under general anesthesia in addition to broad-spectrum antibiotics. Common infectious agents include *Streptococcus* and *Clostridia* species, though there are many isolated organisms, and infections are often polymicrobial. Without surgical intervention and debridement, there is a high mortality rate in cases of necrotizing fasciitis.

Incorrect Answers: A, B, C, and D.

Hyperbaric oxygen therapy (Choice A) may be used as a treatment for nonhealing wounds. However, this patient is presenting with fever, tachycardia, and hypotension in addition to a puncture wound with rapidly extending erythema. Surgical debridement is the most appropriate next step in management in addition to fluid resuscitation



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Necrotizing soft tissue infections may present with erythema, edema, severe pain, fever, crepitus, and skin bullae, and they can progress rapidly. In this case, the patient sustained a small abdominal puncture wound with a history of type 2 diabetes mellitus, which increases his risk for developing a soft tissue infection. Treatment of necrotizing soft tissue infections consists of early surgical exploration and debridement under general anesthesia in addition to broad-spectrum antibiotics. Common infectious agents include *Streptococcus* and *Clostridia* species, though there are many isolated organisms, and infections are often polymicrobial. Without surgical intervention and debridement, there is a high mortality rate in cases of necrotizing fasciitis.

Incorrect Answers: A, B, C, and D.

Hyperbaric oxygen therapy (Choice A) may be used as a treatment for nonhealing wounds. However, this patient is presenting with fever, tachycardia, and hypotension in addition to a puncture wound with rapidly extending erythema. Surgical debridement is the most appropriate next step in management in addition to fluid resuscitation and broad-spectrum antibiotics.

Tetanus immune globulin therapy (Choice B) is required for patients who have not received at least three tetanus toxoid vaccines previously and have a grossly dirty wound. However, this patient is acutely ill with hypotension, tachycardia, and fever with a puncture wound with progressive erythema. Surgical debridement is the most appropriate next step in management.

Negative pressure wound therapy (Choice C) may be used to facilitate healing in wound management. However, this patient is acutely ill with likely necrotizing fasciitis. Surgical debridement is the most appropriate next step in management.

Incision and drainage with local anesthesia (Choice D) may be appropriate in cases of small fluid collections or small abscesses. However, this patient is likely presenting with necrotizing fasciitis, which requires surgical debridement under general anesthesia.

Educational Objective: Necrotizing soft tissue infections may present with erythema, edema, severe pain, fever, crepitus, and skin bullae, and they can rapidly progress. Surgical debridement is required in cases of necrotizing fasciitis as there is a high mortality rate when treated with broad-spectrum antibiotics and fluid resuscitation alone.



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- ✓ 21. A 32-year-old man comes to the emergency department because of feelings of sadness and despair since his wife left him for another man 5 days ago. He also has had decreased appetite, difficulty sleeping, poor concentration, decreased energy, and no interest in the activities he previously enjoyed. He does not drink alcohol or use illicit drugs. Vital signs are within normal limits. Physical examination shows no abnormalities. He has a sad mood and dysphoric affect. He has had thoughts of ending his life but has no plan to kill himself. Which of the following is the most likely diagnosis?
- ☐ A) Acute stress disorder
 - ☒ B) Adjustment disorder
 - ☐ C) Dependent personality disorder
 - ☐ D) Dysthymic disorder
 - ☐ E) Major depressive disorder

Correct Answer: B.

Adjustment disorder refers to the onset of an emotional disturbance within 3 months of an identifiable stressor. The emotional disturbance manifests as marked distress out of proportion to the stressor and a significant impairment in daily school, work, or social functioning. Patients may internalize or externalize their distress, resulting in depression and/or anxiety symptoms or conduct disturbances (acting out), respectively. Patients with adjustment disorder do not meet criteria of anxiety, depressive, or conduct disorders. This patient has several depressive symptoms with a clear stressor and without meeting the 2-week duration criteria for major depressive disorder (MDD). As adjustment disorder is typically self-limited, the treatment of adjustment disorder commonly includes brief supportive psychotherapy.

Incorrect Answers: A, C, D, and E.

Acute stress disorder (Choice A) refers to symptoms of intrusive thoughts or memories, changes in arousal and reactivity (eg, hypervigilance), avoidance of reminders of trauma, and negative mood and/or thoughts that occur within 1 month of a traumatic event, such as physical or sexual violence. This patient has not experienced a violent event and is not reporting intrusive thoughts or avoidance of reminders of the stressor.

Dependent personality disorder (Choice C) is a cluster C personality disorder in which the patient is excessively submissive. Personality disorders are chronic pervasive



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- ☐ D) Dysthymic disorder
- ☐ E) Major depressive disorder

Correct Answer: B.

Adjustment disorder refers to the onset of an emotional disturbance within 3 months of an identifiable stressor. The emotional disturbance manifests as marked distress out of proportion to the stressor and a significant impairment in daily school, work, or social functioning. Patients may internalize or externalize their distress, resulting in depression and/or anxiety symptoms or conduct disturbances (acting out), respectively. Patients with adjustment disorder do not meet criteria of anxiety, depressive, or conduct disorders. This patient has several depressive symptoms with a clear stressor and without meeting the 2-week duration criteria for major depressive disorder (MDD). As adjustment disorder is typically self-limited, the treatment of adjustment disorder commonly includes brief supportive psychotherapy.

Incorrect Answers: A, C, D, and E.

Acute stress disorder (Choice A) refers to symptoms of intrusive thoughts or memories, changes in arousal and reactivity (eg, hypervigilance), avoidance of reminders of trauma, and negative mood and/or thoughts that occur within 1 month of a traumatic event, such as physical or sexual violence. This patient has not experienced a violent event and is not reporting intrusive thoughts or avoidance of reminders of the stressor.

Dependent personality disorder (Choice C) is a cluster C personality disorder in which the patient is excessively submissive. Personality disorders are chronic pervasive patterns of interpersonal dysfunction. This patient does not demonstrate a chronic pattern of submissiveness; instead, he demonstrates acute depressive symptoms.

Dysthymic disorder (Choice D), more commonly called persistent depressive disorder, refers to at least three depression symptoms (including depressed mood during more days than not) that have endured at least 2 years. This patient demonstrates depressive symptoms for 5 days only.

Major depressive disorder (Choice E) includes 2 or more weeks of five of the following symptoms: depressed mood, anhedonia (eg, decreased interest in socializing), guilt or feelings of worthlessness, difficulty concentrating, psychomotor slowing, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). This patient has not met the duration criteria for MDD.

Educational Objective: Adjustment disorder refers to the onset of disproportionate distress within 3 months of an identifiable stressor and may be associated with anxiety, depression, and/or conduct disturbances. Patients with adjustment disorder do not meet criteria of anxiety, depressive, or conduct disorders.



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- ✓ 22. A 57-year-old woman with cirrhosis secondary to chronic hepatitis C is hospitalized because of tense ascites. Her medications are propranolol, furosemide, and spironolactone. On admission, her serum creatinine concentration is 1 mg/dL. Five liters of ascitic fluid is removed on therapeutic paracentesis. Intravenous furosemide and oral spironolactone therapy are begun. During the next 2 days, the patient has a 3.6-kg (8-lb) weight loss. Her pulse is 85/min and regular, and blood pressure is 100/65 mm Hg. Examination shows scleral icterus. Breath sounds are decreased at both lung bases. Abdominal examination shows moderate ascites. Laboratory studies show:

Prothrombin time	30 sec (INR=2.1)
Serum	
Na ⁺	115 mEq/L
K ⁺	3.8 mEq/L
Cl ⁻	79 mEq/L
HCO ₃ ⁻	28 mEq/L
Urea nitrogen	30 mg/dL
Creatinine	2.1 mg/dL
Albumin	2.3 g/dL
Urine volume	<500 mL

In addition to discontinuing spironolactone and furosemide, which of the following is the most appropriate next step in management?

- ☐ A) Lactulose therapy
- ☐ B) Midodrine and octreotide therapy
- ☒ C) Infusion of 2 L of 0.9% saline during the next 24 hours
- ☐ D) Repeat large-volume paracentesis
- ☐ E) Placement of transjugular intrahepatic portosystemic shunt

Correct Answer: C



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Infusion of 2 L of 0.9% saline during the next 24 hours is the best choice in managing this case of a patient who presents with a rise in creatinine concentration and decreased urine output after large-volume paracentesis and diuresis, consistent with acute kidney injury (AKI). AKI is defined as an acute increase in creatinine by greater than or equal to 0.3 mg/dL or an increase greater than or equal to 1.5 times the baseline creatinine, occasionally with oliguria or anuria. Patients may be asymptomatic or show symptoms of uremia, electrolyte disturbances, acidemia, or hyper/hypovolemia if AKI is severe. Determining the cause of AKI, which will guide treatment, involves determining if the problem is from a prerenal, intrinsic, or postrenal cause. Prerenal causes may include sepsis, hypovolemia, hypotension/shock states, or any lesion leading to decreased perfusion pressure at the glomeruli. In this case, liver failure and large-volume paracentesis/diuresis have likely caused prerenal azotemia from both hypovolemia and potentially hepatorenal syndrome (HRS). HRS (AKI due to alterations in splanchnic blood flow in the setting of liver failure) results in decreased renal blood flow as blood is shunted away from the kidney. Reversing prerenal AKI involves restoring renal blood flow, which in this case includes gentle replacement of removed intravascular volume along with discontinuing diuretics. Notably, this patient's sodium concentration is 115 mEq/L. Attention should be paid to the rate of sodium correction when replacing fluid volume; rapid correction from this concentration could result in central pontine demyelination. Safe rates of sodium correction, especially in nutritionally deficient individuals, are generally no more than 6 to 9 mEq/L/day, provided the patient is not having acute central nervous system complications (eg, seizures, cerebral edema) from hyponatremia.

Incorrect Answers: A, B, D, and E.

Lactulose therapy (Choice A) is appropriate in the management of mental status changes from hyperammonemia. It does not have a role in improving AKI in prerenal AKI and may worsen prerenal AKI due to additional fluid losses in stool.

Midodrine and octreotide therapy (Choice B) is a suitable regimen in the management of HRS. However, in this case, such medications would follow volume repletion with crystalloid.

Repeat large-volume paracentesis (Choice D) may worsen this patient's condition, as the initial removal of large amounts of fluid may have precipitated intravascular volume depletion and HRS.

Placement of transjugular intrahepatic portosystemic shunt (TIPS) (Choice E) is indicated in the management of portal hypertension and has been shown to improve outcomes in variceal bleeding, ascites, and HRS. In this case, TIPS could be considered; however, fluid resuscitation will first help restore kidney function and reverse the effect of overdiuresis and large-volume paracentesis.

Educational Objective: Acute kidney injury is defined as an acute increase in creatinine by greater than or equal to 0.3 mg/dL or an increase greater than or equal to 1.5 times the baseline creatinine, occasionally with oliguria or anuria. Determining the cause, which guides treatment, involves determining if the problem is from a prerenal



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- ✓ 23. A 77-year-old woman with dementia, Alzheimer type, is transferred to the emergency department from a skilled nursing care facility because of a 1-day history of abdominal distention, vomiting, and a right groin mass. She has a 15-year history of type 2 diabetes mellitus controlled with diet. She is not oriented to person, place, or time. Her temperature is 37.6°C (99.7°F), pulse is 95/min, respirations are 15/min, and blood pressure is 120/75 mm Hg. Examination shows decreased skin turgor. The abdomen is soft, distended, and mildly tender. Bowel sounds are high pitched. There is a 3-cm, tender, nonreducible mass below the right inguinal ligament. X-rays of the chest and abdomen show dilated loops of small bowel with no gas in the colon; there is a gas-filled loop near the right inguinal ligament. An emergency operation is planned. Which of the following is the most appropriate antibiotic therapy prior to this patient's operation?
- ☒ A) Cefoxitin
 - ☐ B) Gentamicin
 - ☐ C) Oxacillin
 - ☐ D) Vancomycin
 - ☐ E) No preoperative antibiotic therapy is indicated

Correct Answer: A.

Inguinal hernia contents can include preperitoneal fat or may contain intra-abdominal contents such as small bowel, omentum, peritoneum, or large bowel. Many hernias are easily reducible and asymptomatic; however, if the hernia contents become incarcerated within the hernia sac, or if strangulation occurs impeding blood supply, a surgical emergency arises. A strangulated hernia presents with severe pain in the hernia site, often with overlying reactive erythema, fever, and a tender, irreducible mass on examination. Complications such as sepsis and septic shock can arise from necrotic bowel. Thus, treatment includes immediate surgical exploration and hernia reduction, intravenous fluids, broad-spectrum antibiotics, and bowel rest. Appropriate choice of preoperative antibiotics for this patient includes cefoxitin, a second-generation cephalosporin that has a broad spectrum of activity against gram-positive and gram-negative organisms.

Incorrect Answers: B, C, D, and E.

Gentamicin (Choice B), an aminoglycoside antibiotic, is commonly used to treat neonatal sepsis, meningitis, and pneumonia, pelvic inflammatory disease, endocarditis, and



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- ☐ D) vancomycin
- ☐ E) No preoperative antibiotic therapy is indicated

Correct Answer: A.

Inguinal hernia contents can include preperitoneal fat or may contain intra-abdominal contents such as small bowel, omentum, peritoneum, or large bowel. Many hernias are easily reducible and asymptomatic; however, if the hernia contents become incarcerated within the hernia sac, or if strangulation occurs impeding blood supply, a surgical emergency arises. A strangulated hernia presents with severe pain in the hernia site, often with overlying reactive erythema, fever, and a tender, irreducible mass on examination. Complications such as sepsis and septic shock can arise from necrotic bowel. Thus, treatment includes immediate surgical exploration and hernia reduction, intravenous fluids, broad-spectrum antibiotics, and bowel rest. Appropriate choice of preoperative antibiotics for this patient includes cefoxitin, a second-generation cephalosporin that has a broad spectrum of activity against gram-positive and gram-negative organisms.

Incorrect Answers: B, C, D, and E.

Gentamicin (Choice B), an aminoglycoside antibiotic, is commonly used to treat neonatal sepsis, meningitis, and pneumonia, pelvic inflammatory disease, endocarditis, and osteomyelitis. It is ototoxic, nephrotoxic, and neurotoxic, however, making it suboptimal when alternatively suitable and safer medications are available.

Oxacillin (Choice C) is a narrow-spectrum antibiotic that is used clinically to treat methicillin-sensitive *Staphylococcus aureus* infections. In a patient undergoing abdominal surgery, a broad-spectrum antibiotic with activity against gram-negative organisms is more appropriate.

Vancomycin (Choice D) inhibits the synthesis of bacterial cell walls, and therefore has the greatest activity against gram-positive organisms. It would be an appropriate choice to treat osteomyelitis, septic arthritis, or skin and soft tissue infections caused by *S. aureus*. Since this patient is undergoing abdominal surgery, antibiotic choice should include activity against gram-negative organisms.

No preoperative antibiotic therapy is indicated (Choice E) is inappropriate, as sepsis is a complication of strangulated inguinal hernias. Antibiotics should be administered preoperatively.

Educational Objective: Necrotic bowel, sepsis, and septic shock are complications of strangulated inguinal hernias. Preoperative antibiotics should be broad-spectrum and include activity against gram-positive and gram-negative organisms.



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- ✓ 24. A 77-year-old woman is brought to the emergency department 2 hours after the sudden onset of shortness of breath. She has hyperlipidemia treated with atorvastatin and hypertension treated with lisinopril, hydrochlorothiazide, and amlodipine. She is 163 cm (5 ft 4 in) tall and weighs 55 kg (120 lb); BMI is 21 kg/m². Her temperature is 37.2°C (98.9°F), pulse is 104/min, respirations are 24/min, and blood pressure is 194/102 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 83%. Crackles are heard at both lung bases. There is an S₄. Her serum creatinine concentrations 1 year ago and today are 1.5 mg/dL and 2 mg/dL, respectively. Intravenous furosemide is administered, and her symptoms improve. Echocardiography shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) Measurement of plasma renin activity
 - ☐ B) Measurement of serum aldosterone concentration
 - ☐ C) Measurement of serum metanephrine concentration
 - ☒ D) Renal duplex ultrasonography
 - ☐ E) Renal biopsy

Correct Answer: D.

This patient, presenting with acute severe shortness of breath and markedly increased blood pressure, is likely experiencing acute pulmonary edema. Given her improvement with diuretics and rising creatinine, renovascular causes of hypertension should be considered. Renal artery stenosis is a cause of secondary hypertension related to activation of the renin-angiotensin-aldosterone system. Low afferent blood flow to the affected kidney leads to abnormal stimulation of the juxtaglomerular apparatus and excessive production of renin. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension. Angiotensin II also leads to increased Na⁺ reabsorption in the renal tubules, aldosterone release by the adrenal cortex with subsequent increased Na⁺ and fluid retention and hypokalemia, vasopressin release from the posterior pituitary leading to increased fluid retention, enhanced adrenergic function through inhibition of norepinephrine reuptake in sympathetic nerve endings, and stimulation of hypothalamic thirst centers. In younger patients, fibromuscular dysplasia is the most common cause of renal artery stenosis; in older patients, it is typically due to atherosclerosis. An abdominal bruit may be heard in the region of the stenosis. Renal vein sampling may detect increased renin activity on the affected side. Diagnosis is established with renal duplex Doppler ultrasonography or MR angiography, which can quantify the degree of renal artery stenosis and associated renal atrophy. Treatment involves angioplasty or stenting of the stenosed renal artery to improve flow.

improvement with diuretics and rising creatinine, renovascular causes of hypertension should be considered. Renal artery stenosis is a cause of secondary hypertension related to activation of the renin-angiotensin-aldosterone system. Low afferent blood flow to the affected kidney leads to abnormal stimulation of the juxtaglomerular apparatus and excessive production of renin. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension. Angiotensin II also leads to increased Na^+ reabsorption in the renal tubules, aldosterone release by the adrenal cortex with subsequent increased Na^+ and fluid retention and hypokalemia, vasopressin release from the posterior pituitary leading to increased fluid retention, enhanced adrenergic function through inhibition of norepinephrine reuptake in sympathetic nerve endings, and stimulation of hypothalamic thirst centers. In younger patients, fibromuscular dysplasia is the most common cause of renal artery stenosis; in older patients, it is typically due to atherosclerosis. An abdominal bruit may be heard in the region of the stenosis. Renal vein sampling may detect increased renin activity on the affected side. Diagnosis is established with renal duplex Doppler ultrasonography or MR angiography, which can quantify the degree of renal artery stenosis and associated renal atrophy. Treatment involves angioplasty or stenting of the stenosed renal artery to improve flow.

Incorrect Answers: A, B, C, and E.

Measurement of plasma renin activity (Choice A) and measurement of serum aldosterone concentration (Choice B) are performed in investigation of hyperaldosteronism. Hyperaldosteronism is also a cause of secondary hypertension. Excess aldosterone production from an adrenal adenoma or bilateral adrenal hyperplasia causes hypertension from salt and water retention, along with hypokalemia and metabolic alkalosis. Diagnosis is made by measuring renin and aldosterone, which shows an abnormally high serum aldosterone concentration and undetectable renin activity. Renin and aldosterone are nonspecific for renal atherosclerotic disease.

Measurement of serum metanephrine concentration (Choice C) is appropriate in the investigation of potential pheochromocytoma, a rare endocrine malignancy that produces catecholamines among other biologically active hormones. Excess catecholamine production from such tumors presents with tachycardia, hypertension, and sweating, among other symptoms not seen in this case.

Renal biopsy (Choice E) is helpful in the diagnosis of nephrotic and nephritic syndromes, which can present with proteinuria and hematuria as well as signs and symptoms of volume overload and peripheral edema. This patient's most likely cause of hypertension is renovascular hypertension, which is diagnosed with ultrasonography or angiography of the renal arteries.

Educational Objective: Renal artery stenosis is a cause of secondary hypertension due to abnormal activation of the renin-angiotensin-aldosterone system. Diagnosis is established with renal duplex Doppler ultrasonography or MR angiography, which can quantify the degree of renal artery stenosis and associated renal atrophy.



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- ✓ 25. A 67-year-old woman comes to the physician because of a 2-week history of persistent cough productive of white sputum. The cough awakens her from sleep and is not relieved by an over-the-counter cough suppressant. Last night, she had an episode of sweating and flushing that occurred immediately following a coughing episode. During the past 3 days, she has had three episodes of vomiting after coughing. One month ago, she had nasal congestion, low-grade fever, and sneezing that resolved spontaneously. She did not have postnasal drainage. She has no history of serious illness and takes no medications. She smoked one-half pack of cigarettes daily for 5 years but quit 40 years ago. She volunteers at a soup kitchen once weekly. The patient appears healthy and is not coughing. Her temperature is 37.8°C (100°F), pulse is 91/min, respirations are 14/min, and blood pressure is 120/78 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 95%. Cardiopulmonary examination shows no abnormalities. Her leukocyte count is 22,000/mm³ (39% segmented neutrophils, 1% bands, and 60% lymphocytes). Which of the following is the most likely diagnosis?
- ☐ A) Anaerobic pneumonia
 - ☐ B) Chronic bronchitis
 - ☐ C) Miliary tuberculosis
 - ☐ D) Mycoplasmal pneumonia
 - ☒ E) Pertussis

Correct Answer: E.

Episodes of severe paroxysmal coughing in the setting of a respiratory illness are suggestive of pertussis. Pertussis occurs due to an infection from *Bordetella pertussis* and classically presents in three stages. The catarrhal stage is first, which presents with fever, rhinorrhea, and a mild cough. This progresses to the paroxysmal stage after 1 to 2 weeks, in which patients experience violent bouts of extreme coughing, at times violent enough to cause complications such as rib fractures, urinary incontinence, and pneumothorax. Often, such coughing fits are accompanied by cyanosis and may be followed by syncope, emesis, or apnea. The paroxysmal stage can last for weeks to months. Treatment is with antibiotics, typically macrolides, and supportive care. Immunization can help prevent infection and is typically administered as a combination vaccine. Children aged 7 years and younger receive the diphtheria and tetanus toxoid vaccine (DTaP) and adolescents and adults receive the tetanus toxoid, diphtheria toxoid, and acellular pertussis (Tdap) vaccine.



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Episodes of severe paroxysmal coughing in the setting of a respiratory illness are suggestive of pertussis. Pertussis occurs due to an infection from *Bordetella pertussis* and classically presents in three stages. The catarrhal stage is first, which presents with fever, rhinorrhea, and a mild cough. This progresses to the paroxysmal stage after 1 to 2 weeks, in which patients experience violent bouts of extreme coughing, at times violent enough to cause complications such as rib fractures, urinary incontinence, and pneumothorax. Often, such coughing fits are accompanied by cyanosis and may be followed by syncope, emesis, or apnea. The paroxysmal stage can last for weeks to months. Treatment is with antibiotics, typically macrolides, and supportive care. Immunization can help prevent infection and is typically administered as a combination vaccine. Children aged 7 years and younger receive the diphtheria and tetanus toxoid vaccine (DTaP) and adolescents and adults receive the tetanus toxoid, diphtheria toxoid, and acellular pertussis (Tdap) vaccine.

Incorrect Answers: A, B, C, and D.

Anaerobic pneumonia (Choice A) may present with chest pain, which is typically pleuritic and exacerbated by coughing. Patients with pneumonia present with signs and symptoms including fever, chills, shortness of breath, productive cough, tachypnea, and radiographic evidence of pulmonary consolidation. Examination of the affected lobes would disclose decreased breath sounds and increased tactile fremitus as the consolidated lung is adjacent to the body wall.

Chronic bronchitis (Choice B) refers to chronic inflammation of the bronchi and is commonly seen in patients with tobacco use. It is defined as the presence of a productive cough on most days over a 3-month period for at least 2 consecutive years in patients who do not have another cause of cough. Auscultation may disclose wheezing.

Miliary tuberculosis (Choice C) is caused by the hematologic dissemination of *Mycobacterium tuberculosis* and commonly involves the lungs, lymphatic system, bones, liver, and central nervous system. It is often seen in patients from endemic areas, from crowded living situations, or those who are immunocompromised. Symptoms include cough, often with hemoptysis, fever, and night sweats.

Mycoplasma pneumoniae (Choice D) is a common atypical bacterial cause of community-acquired pneumonia and presents with acute cough, fever, chills, and shortness of breath. The chest x-ray would typically show multifocal infiltrates. A prolonged course and severe cough that causes emesis would not be expected.

Educational Objective: Pertussis occurs due to an infection from *Bordetella pertussis* and may lead to severe paroxysmal coughing, which may be accompanied by cyanosis and followed by syncope, emesis, or apnea. Treatment is with antibiotics, typically macrolides. Immunization can help prevent infection and is administered as a combination vaccine for children and adults.



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- ✓ 26. A 50-year-old woman with chronic obstructive pulmonary disease (COPD) comes to the office to discuss smoking cessation. The patient says she has tried to quit smoking five times in the past but has been discouraged because each time she resumed smoking. Medical history is also significant for hypertension. Medications include ipratropium, albuterol, and amlodipine. The patient has smoked two packs of cigarettes daily for the past 35 years. BMI is 18 kg/m². Vital signs are temperature 36.7°C (98.0°F), pulse 70/min, respirations 16/min, and blood pressure 120/70 mm Hg. Physical examination discloses clubbing of the fingers. Auscultation of the lungs discloses scattered wheezes. The patient says she is willing to make another attempt to quit smoking and to set a quit date. Which of the following is the most appropriate next step?
- ☐ A) Advise her that there are no treatment options since she has failed quit attempts in the past
 - ☐ B) Advise her to use an over-the-counter nicotine replacement
 - ☐ C) Give her a telephone number for a smoking cessation hotline and advise her to chew gum
 - ☒ D) Prescribe varenicline and refer her to a smoking cessation class

Correct Answer: D.

Physicians should address smoking cessation at each visit. These discussions may begin with motivational interviewing, which uses open-ended questions to encourage patients to explore their reasons to change behavior (eg, quitting smoking) and increases patient readiness for the change. This patient appears to be in the action stage, so the physician should construct an action plan with the patient. The most effective action plan includes a combination of pharmacologic therapy and behavioral support. Behavioral support can range from brief counseling by the physician to a quitline to a smoking cessation class. This patient's history of multiple unsuccessful attempts suggests that a more intensive behavioral intervention should be pursued. First-line pharmacologic interventions include nicotine replacement (typically a patch plus a short-acting form), varenicline, or bupropion. Varenicline is a partial agonist at the nicotinic acetylcholine receptor, which causes decreased cravings for cigarettes.

Incorrect Answers: A, B, and C.

Advise her that there are no treatment options since she has failed quit attempts in the past (Choice A) is inaccurate. Failed attempts to quit constitute part of the definition



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- ☐ C) Give her a telephone number for a smoking cessation hotline and advise her to chew gum
- ☒ D) Prescribe varenicline and refer her to a smoking cessation class

Correct Answer: D.

Physicians should address smoking cessation at each visit. These discussions may begin with motivational interviewing, which uses open-ended questions to encourage patients to explore their reasons to change behavior (eg, quitting smoking) and increases patient readiness for the change. This patient appears to be in the action stage, so the physician should construct an action plan with the patient. The most effective action plan includes a combination of pharmacologic therapy and behavioral support. Behavioral support can range from brief counseling by the physician to a quitline to a smoking cessation class. This patient's history of multiple unsuccessful attempts suggests that a more intensive behavioral intervention should be pursued. First-line pharmacologic interventions include nicotine replacement (typically a patch plus a short-acting form), varenicline, or bupropion. Varenicline is a partial agonist at the nicotinic acetylcholine receptor, which causes decreased cravings for cigarettes.

Incorrect Answers: A, B, and C.

Advise her that there are no treatment options since she has failed quit attempts in the past (Choice A) is inaccurate. Failed attempts to quit constitute part of the definition of nicotine use disorder, and fortunately there are evidence-based treatments for nicotine use disorder. Furthermore, the vignette does not outline previously used strategies for quitting; it is possible this patient has not yet tried evidence-based interventions.

Advise her to use an over-the-counter nicotine replacement (Choice B) and give her a telephone number for a smoking cessation hotline and advise her to chew gum (Choice C) are unlikely to provide robust enough treatment. Preferred nicotine replacement typically includes a patch plus a short-acting form such as gum or lozenges, not monotherapy with gum. Combination pharmacologic therapy and behavioral support is most effective.

Educational Objective: The most effective smoking cessation plans include both pharmacologic and behavioral interventions. Evidence-based pharmacologic treatment includes nicotine replacement (typically a patch plus a short-acting form), varenicline, or bupropion.



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- ✓ 27. A 22-year-old man comes to the physician for a health maintenance examination. He has no history of serious illness and takes no medications. He has no known allergies. At the age of 3 years, he underwent orchiopexy for cryptorchidism. The patient does not smoke cigarettes or drink alcohol. His temperature is 36.8°C (98.2°F), pulse is 58/min, respirations are 12/min, and blood pressure is 104/68 mm Hg. Examination shows a well-healed scar in the right inguinal region. No other abnormalities are noted. This patient is at increased risk for which of the following disorders?
- ☐ A) Direct inguinal hernia
 - ☐ B) Hydrocele
 - ☐ C) Spermatocele
 - ☒ D) Testicular cancer
 - ☐ E) Testicular torsion

Correct Answer: D.

Cryptorchidism refers to an undescended or incompletely descended testis. In normal development of the fetus, the developing testis migrates transabdominally to the inguinal ring by approximately 28 weeks' gestation. The testis then travels through the inguinal canal into the scrotum by 40 weeks' gestation. It is a common genital abnormality among premature neonates, with reports of as many as 30% of preterm genetic male neonates having the condition. It is less common but still present in around 3% of full-term male newborns. Frequently, the testis completes descent into the scrotal sac within the first 6 months of life. If the testis does not descend by this point, it is unlikely to spontaneously do so, and surgical correction is indicated. Diagnosing cryptorchidism is based on physical examination, identifying an absence of a palpable testis in the scrotum. Treatment of cryptorchidism involves orchiopexy, the surgical fixation of the testis to the scrotal sac. There are many complications associated with cryptorchidism, including increased risk for testicular cancer and infertility, for which this patient is at risk. Seminoma is the most common testicular malignancy associated with cryptorchidism.

Incorrect Answers: A, B, C, and E.

Direct inguinal hernia (Choice A) describes the herniation of intra-abdominal/pelvic contents through the triangle of Hesselbach (inguinal triangle). These types of hernias result from weakening of the abdominal wall and generally contain fat or bowel. An indirect inguinal hernia would be more likely in the case of cryptorchidism, as a patent



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Correct Answer: D.

Cryptorchidism refers to an undescended or incompletely descended testis. In normal development of the fetus, the developing testis migrates transabdominally to the inguinal ring by approximately 28 weeks' gestation. The testis then travels through the inguinal canal into the scrotum by 40 weeks' gestation. It is a common genital abnormality among premature neonates, with reports of as many as 30% of preterm genetic male neonates having the condition. It is less common but still present in around 3% of full-term male newborns. Frequently, the testis completes descent into the scrotal sac within the first 6 months of life. If the testis does not descend by this point, it is unlikely to spontaneously do so, and surgical correction is indicated. Diagnosing cryptorchidism is based on physical examination, identifying an absence of a palpable testis in the scrotum. Treatment of cryptorchidism involves orchiopexy, the surgical fixation of the testis to the scrotal sac. There are many complications associated with cryptorchidism, including increased risk for testicular cancer and infertility, for which this patient is at risk. Seminoma is the most common testicular malignancy associated with cryptorchidism.

Incorrect Answers: A, B, C, and E.

Direct inguinal hernia (Choice A) describes the herniation of intra-abdominal/pelvic contents through the triangle of Hesselbach (inguinal triangle). These types of hernias result from weakening of the abdominal wall and generally contain fat or bowel. An indirect inguinal hernia would be more likely in the case of cryptorchidism, as a patent processus vaginalis more commonly occurs in this condition.

Hydrocele (Choice B), a collection of fluid within the tunica vaginalis, is associated with a patent processus vaginalis, which can be associated with cryptorchidism. Hydrocele and cryptorchidism are not associated otherwise.

Spermatocele (Choice C) describes a sac of fluid that usually develops within the epididymis that contains sperm. They are generally benign, and the causes are often unknown.

Testicular torsion (Choice E) is a twisting of the testicle about its vascular supply, resulting in venous and then arterial occlusion/infarction. It is associated with abnormal anchoring of the testicle within the scrotal sac. Orchiopexy, a surgical procedure used to treat cryptorchidism, fixes the testis within the scrotal sac and prevents the development of testicular torsion.

Educational Objective: Cryptorchidism refers to an undescended or incompletely descended testis. Complications include increased risk for testicular cancer and infertility. Treatment of cryptorchidism involves orchiopexy, the surgical fixation of the testis to the tissue within the scrotal sac.



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28. A previously healthy 20-year-old man is brought to the emergency department because of a 12-hour history of increasing fever and confusion. He has never seen a physician. He takes no medications. His temperature is 40°C (104°F), pulse is 110/min, respirations are 18/min, and blood pressure is 100/70 mm Hg. On arrival, he is delirious. Examination shows a diffuse rash over the body. A photograph of the rash is shown. There is moderate nuchal rigidity. The remainder of the examination shows no abnormalities. Immunization against which of the following is most likely to have prevented this patient's condition?

- ☐ A) *Haemophilus influenzae*
- ☐ B) Measles virus
- ☒ C) *Neisseria meningitidis*
- ☐ D) *Streptococcus pneumoniae*
- ☐ E) Varicella-zoster virus

Correct Answer: C.

This unvaccinated patient presents with symptoms of acute meningococcal meningitis including fever, confusion/altered mental status, neck stiffness, and a diffuse purpuric rash. Headache, photophobia, and phonophobia are also classic symptoms. Meningococcal meningitis is caused by infection of the meninges with *Neisseria meningitidis*, the most common cause of bacterial meningitis in teenagers and young adults. Clusters of infections may be seen among young adults sharing close living quarters such as college dormitories or military barracks. Meningococcal conjugate vaccination is routinely recommended to be given to children and adolescents with a first dose at age 11-12 years and a booster dose at age 16. A second type of meningococcal vaccination (Men B), which is targeted at serogroup B meningococcus, is not generally recommended to be given routinely to healthy individuals (although expert opinion varies). It is usually recommended (based on shared decision making) only for those ages 16 through 23 years of age who become at increased risk for this serotype (eg, through occupational risk, during an outbreak). Finally, specific vaccine strategies vary for children and adults who have conditions that make them at increased risk for meningococcal disease (eg, asplenia, immune deficiency, travel to high-risk areas).

Incorrect Answers: A, B, D, and E.



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first dose at age 11-12 years and a booster dose at age 16. A second type of meningococcal vaccination (Men B), which is targeted at serogroup B meningococcus, is not generally recommended to be given routinely to healthy individuals (although expert opinion varies). It is usually recommended (based on shared decision making) only for those ages 16 through 23 years of age who become at increased risk for this serotype (eg, through occupational risk, during an outbreak). Finally, specific vaccine strategies vary for children and adults who have conditions that make them at increased risk for meningococcal disease (eg, asplenia, immune deficiency, travel to high-risk areas).

Incorrect Answers: A, B, D, and E.

Haemophilus influenzae (Choice A) is not a common cause of bacterial meningitis or bacteremia. It often causes respiratory infections, and, classically, causes epiglottitis (type B) in unvaccinated children.

Measles virus (Choice B) presents with fever, cough, coryza, conjunctivitis, and maculopapular rash. It classically infects unvaccinated children. This patient has a purpuric rash and altered mental status, which is more consistent with meningococcal meningitis.

Streptococcus pneumoniae (Choice D) is the most common cause of bacterial meningitis in the general population. It often follows a respiratory infection, and presents with fever, headache, photophobia, phonophobia, neck stiffness, and altered mental status. *N. meningitidis* is the most common cause of meningitis in young adults, and classically presents with a purpuric rash.

Varicella-zoster virus (Choice E) causes chickenpox, a virus affecting unvaccinated children that presents with fever, and erythematous macules that become vesicles, in various stages of healing. It can reactivate, causing herpes zoster, which presents with a vesicular rash in a dermatomal distribution. This patient's rash is purpuric.

Educational Objective: Immunization against *Neisseria meningitidis* is routinely indicated in the teenage years to young adulthood or for patients who are at increased risk for meningococcal disease. Administration of the vaccine can prevent meningococcal meningitis, which classically presents in a young adult with fever, neck stiffness, headache, photo/phonophobia, altered mental status, and purpuric rash.

✓ 29. A 62-year-old woman comes to the physician because of a 2-day history of moderate left-sided lower abdominal pain. She also has had nausea and loss of appetite during this time. She has not had vomiting. She has hypertension well controlled with hydrochlorothiazide. Her temperature is 38.4°C (101.1°F), pulse is 98/min, respirations are 14/min, and blood pressure is 120/78 mm Hg. Abdominal examination shows tenderness to palpation of the left lower quadrant; there is no guarding or rebound. Bowel sounds are decreased. Rectal examination shows no abnormalities. Test of the stool for occult blood is negative. Laboratory studies show:

Hemoglobin	13.2 g/dL
Hematocrit	36%
Leukocyte count	14,000/mm ³
Platelet count	350,000/mm ³

Results of other laboratory studies are within the reference ranges. Chest and abdominal x-rays show no abnormalities. Which of the following is the most appropriate next step in management?

- ☒ A) Amoxicillin-clavulanate therapy
- ☐ B) Barium enema
- ☐ C) Flexible sigmoidoscopy
- ☐ D) Mesalamine therapy
- ☐ E) Small-bowel follow-through

Correct Answer: A.

Diverticulitis is a common cause of left lower quadrant abdominal pain and tenderness in adults. It often presents with fever, nausea, and sometimes vomiting. It results from inflammation involving pre-existing diverticula. Complications of diverticulitis include perforation leading to peritonitis, abscess formation, bowel obstruction, and fistula formation. Treatment includes bowel rest, symptomatic control, and antibiotics covering enteric flora. Antibiotic regimens that cover enteric flora and are common in treating diverticulitis include amoxicillin-clavulanate or a combination of ciprofloxacin and metronidazole.

Correct Answer: A.

Diverticulitis is a common cause of left lower quadrant abdominal pain and tenderness in adults. It often presents with fever, nausea, and sometimes vomiting. It results from inflammation involving pre-existing diverticula. Complications of diverticulitis include perforation leading to peritonitis, abscess formation, bowel obstruction, and fistula formation. Treatment includes bowel rest, symptomatic control, and antibiotics covering enteric flora. Antibiotic regimens that cover enteric flora and are common in treating diverticulitis include amoxicillin-clavulanate or a combination of ciprofloxacin and metronidazole.

Incorrect Answers: B, C, D, and E.

Barium enema (Choice B) has no role in the treatment of diverticulitis. Rather, it is used to evaluate the lumen of the large bowel to assist in the diagnosis of colonic neoplasms, strictures, fistulas, or postsurgical complications. It can also be used in children to evaluate for congenital megacolon (Hirschsprung disease) and intestinal malrotation.

Flexible sigmoidoscopy (Choice C) is used in the management of sigmoid volvulus. A sigmoid volvulus results from twisting of the sigmoid mesentery, which can lead to large bowel obstruction and perforation or intestinal necrosis if not treated. Patients commonly present with symptoms secondary to a large bowel obstruction such as constipation, abdominal bloating, distension, nausea, and vomiting. Sigmoid volvulus typically shows a coffee-bean appearance on abdominal x-rays with severe distension of the sigmoid colon.

Mesalamine (Choice D) is an anti-inflammatory medication often used in the treatment of ulcerative colitis. Ulcerative colitis is an inflammatory bowel disease that results in inflammation and ulceration of the colonic mucosa and submucosa. Symptoms include chronic abdominal pain, weight loss, bloody diarrhea, abdominal bloating, and tenesmus.

Small-bowel follow-through (Choice E) is indicated when structural lesions involving the stomach or small bowel are suspected. This is most commonly indicated for the evaluation of small bowel pathology, such as duodenal atresia, malrotation with volvulus, and Crohn disease. This patient's symptoms are suggestive of diverticulitis, which is a lower intestinal pathology.

Educational Objective: Diverticulitis presents with left lower quadrant abdominal pain, often accompanied by nausea, fever, and tenderness to palpation of the left lower quadrant. Antibiotic therapy and bowel rest is an appropriate treatment combination for diverticulitis.



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- ✓ 30. A 47-year-old man comes to the physician for a follow-up examination. He has hypertension treated with ramipril and gout treated with allopurinol. He has not had a gout flare during the past 6 months. His only other medication is aspirin. He is 180 cm (5 ft 11 in) tall and weighs 109 kg (240 lb); BMI is 34 kg/m². His blood pressure is 152/95 mm Hg. Examination shows truncal obesity. Six months ago, his serum creatinine concentration was 1.4 mg/dL. Serum studies today show:

Na ⁺	134 mEq/L
K ⁺	4.8 mEq/L
Cl ⁻	104 mEq/L
HCO ₃ ⁻	24 mEq/L
Urea nitrogen	43 mg/dL
Glucose	107 mg/dL
Creatinine	1.5 mg/dL
Uric acid	6.4 mg/dL

Which of the following is the most appropriate additional pharmacotherapy?

- ☒ A) Amlodipine
- ☐ B) Colchicine
- ☐ C) Hydrochlorothiazide
- ☐ D) Probenecid
- ☐ E) No additional pharmacotherapy is indicated

Correct Answer: A.

Amlodipine, a dihydropyridine calcium channel blocker, is the most appropriate medication to initiate at this time. This patient presents with suboptimal control of hypertension, detected during a routine health examination without symptoms. He has multiple risk factors for cardiovascular disease including obesity and has signs of



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☐ E) No additional pharmacotherapy is indicated

Correct Answer: A.

Amlodipine, a dihydropyridine calcium channel blocker, is the most appropriate medication to initiate at this time. This patient presents with suboptimal control of hypertension, detected during a routine health examination without symptoms. He has multiple risk factors for cardiovascular disease including obesity and has signs of developing or worsening chronic kidney disease, likely hypertensive nephropathy. Improving control of his blood pressure will limit progression of disease and decrease his overall associated morbidity and mortality. First-line medications used in the management of hypertension include ACE inhibitors, calcium channel blockers, and thiazide diuretics. In this case, the patient is already taking an ACE inhibitor and has contraindications to taking hydrochlorothiazide. The next best medication to add is a calcium channel blocker, such as amlodipine.

Incorrect Answers: B, C, D, and E.

Colchicine (Choice B), a microtubule inhibitor, is used in the management of gout and inflammatory conditions such as pericarditis. This patient has no symptoms of any gout flare, and adding this medication would be inappropriate at this time. If he has a flare of gout in the future, it can be considered at that time.

Hydrochlorothiazide (Choice C) is a thiazide diuretic and is a recommended first-line medication in the management of essential hypertension. However, it carries increased serum uric acid as a side effect, and therefore the risk for gout flares increases with its use.

Probenecid (Choice D) is used in the management of gout as it prevents flares by reduction of uric acid concentration. This patient has no symptoms of any gout flare and has had no recent flares. Adding this medication is unnecessary currently. If he has a flare of gout in the future, it can be considered at that time. Additionally, while normal laboratory reference ranges vary, uric acid concentrations up to 7.0 mg/dL are generally within normal limits for biologically male patients.

No additional pharmacotherapy is indicated (Choice E) is incorrect. The patient has persistent hypertension and worsening chronic kidney disease. Treating hypertension will decrease the patient's risk of future morbidity and mortality from atherosclerotic cardiovascular disease and direct consequences of long-term hypertension (eg, hypertensive nephropathy, retinopathy, cardiac hypertrophy).

Educational Objective: Management of hypertension includes ACE inhibitors, calcium channel blockers, and thiazide diuretics as first-line medications. Patient comorbidities, medication interactions, and tolerances should be considered when choosing additional medications to add to the management of hypertension.



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- ✓ 31. A 25-year-old woman, gravida 2, para 1, at 20 weeks' gestation comes to the physician for a routine prenatal visit. She has hypertension well controlled with labetalol. Her first pregnancy was uncomplicated and ended in spontaneous vaginal delivery of a newborn at term. Her only other medication is a prenatal vitamin. Her blood pressure is 120/80 mm Hg. Examination shows no peripheral edema. Urinalysis shows no glucose or protein. This patient is at greatest risk for which of the following pregnancy complications?
- ☐ A) Fetal demise
 - ☐ B) Gestational diabetes
 - ☐ C) Polyhydramnios
 - ☒ D) Preeclampsia
 - ☐ E) Preterm labor

Correct Answer: D.

Preeclampsia is caused by an abnormality of the placental spiral arteries and poor trophoblastic invasion, leading to placental hypoperfusion and the subsequent production of vasoactive hormones that cause generalized endothelial dysfunction, hypercoagulability, and vasospasm. Preeclampsia may lead to uteroplacental insufficiency that puts the fetus at risk for fetal growth restriction. If untreated, preeclampsia can progress to eclampsia, characterized by maternal seizures, which can have profoundly adverse outcomes. Pre-existing hypertension or prior history of preeclampsia are the biggest risk factors for its development. This patient's history of hypertension increases her risk for the development of preeclampsia.

Incorrect Answers: A, B, C, and E.

Fetal demise (Choice A) refers to the lack of fetal cardiac activity after 20 weeks' gestation. In high-income countries, it is most commonly due to chromosomal abnormalities, uteroplacental insufficiency, and maternal medical disease, whereas it is more commonly due to maternal infection, preeclampsia, or obstructed labor in low-income countries. This patient is at greater risk for preeclampsia.

Gestational diabetes (Choice B) risk factors include obesity, polycystic ovary syndrome, previous gestational diabetes, and certain ethnicities. This patient currently has no known risk factors for the development of gestational diabetes.



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Correct Answer: D.

Preeclampsia is caused by an abnormality of the placental spiral arteries and poor trophoblastic invasion, leading to placental hypoperfusion and the subsequent production of vasoactive hormones that cause generalized endothelial dysfunction, hypercoagulability, and vasospasm. Preeclampsia may lead to uteroplacental insufficiency that puts the fetus at risk for fetal growth restriction. If untreated, preeclampsia can progress to eclampsia, characterized by maternal seizures, which can have profoundly adverse outcomes. Pre-existing hypertension or prior history of preeclampsia are the biggest risk factors for its development. This patient's history of hypertension increases her risk for the development of preeclampsia.

Incorrect Answers: A, B, C, and E.

Fetal demise (Choice A) refers to the lack of fetal cardiac activity after 20 weeks' gestation. In high-income countries, it is most commonly due to chromosomal abnormalities, uteroplacental insufficiency, and maternal medical disease, whereas it is more commonly due to maternal infection, preeclampsia, or obstructed labor in low-income countries. This patient is at greater risk for preeclampsia.

Gestational diabetes (Choice B) risk factors include obesity, polycystic ovary syndrome, previous gestational diabetes, and certain ethnicities. This patient currently has no known risk factors for the development of gestational diabetes.

Polyhydramnios (Choice C) is an excess amount of amniotic fluid that is common in multiple gestation pregnancy, maternal diabetes, and fetal malformations such as duodenal or esophageal atresia and anencephaly. This patient currently has no risk factors for the development of polyhydramnios.

Preterm labor (Choice E) occurs after 20 weeks' and before 37 weeks' gestation. Patients in preterm labor usually present with irregular, mild contractions, pressure in the pelvis, and vaginal discharge or spotting. This patient's prior pregnancy resulted in delivery of a newborn at term. Risk factors for preterm labor include the extremes of reproductive age, a short interpregnancy interval, multiple gestations, fetal abnormalities, poly- or oligohydramnios, maternal substance use, uterine infection, and preeclampsia, among others.

Educational Objective: Preeclampsia is caused by an abnormality of the placental spiral arteries and poor trophoblastic invasion, leading to placental hypoperfusion and the subsequent production of vasoactive hormones that cause generalized endothelial dysfunction, hypercoagulability, and vasospasm. Pre-existing hypertension or prior history of preeclampsia are the biggest risk factors for its development.



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32. A 10-year-old boy with attention-deficit/hyperactivity disorder is brought to the physician by his parents for a follow-up examination. He has a 5-year history of hyperactivity, impulsivity, and distractibility at home and school. Cognitive behavioral therapy for the patient and his parents has yielded mild improvement in the patient's symptoms. The patient has no other history of serious illness and takes no medications. A maternal cousin has epilepsy, and a maternal uncle died at the age of 25 years while playing basketball. The patient's vital signs are within normal limits. Physical examination shows no abnormalities. The patient fidgets throughout the examination. Mental status examination shows easy distractibility. The parents say they are considering pharmacotherapy for the patient but are concerned about the potential adverse effects of psychostimulants. In addition to discussing the risks and benefits of pharmacotherapy for this patient's condition, which of the following is the most appropriate next step before initiating psychostimulant therapy?

- ☒ A) ECG
- ☐ B) EEG
- ☐ C) Increased frequency of cognitive behavioral therapy sessions
- ☐ D) Neuropsychological testing
- ☐ E) Omega-3 acid ethyl ester supplementation

Correct Answer: A.

Attention-deficit/hyperactivity disorder (ADHD) presents with chronic symptoms of hyperactivity/impulsivity and/or inattention that occur in more than one setting and impair academic, social, and/or emotional function. Stimulants, which include amphetamine salts and methylphenidate, are first-line agents that increase synaptic dopamine and norepinephrine. Common adverse effects include appetite suppression, anxiety, insomnia, and headaches. Patients also commonly experience mild increases in heart rate and blood pressure. There have been a few reports of sudden cardiac deaths, though larger studies have not shown an increased risk. Even so, it is prudent to gather a thorough cardiac history, family cardiac history, and physical examination. If cardiac concerns are identified (eg, this patient's family history of sudden cardiac death at a young age), further cardiac testing including an ECG should be considered. Notably, it is not necessary to obtain a routine ECG prior to initiating stimulant therapy in patients without these cardiac risk factors.

Incorrect Answers: B, C, D, and E.



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- ☒ C) Increased frequency of cognitive behavioral therapy sessions
- ☐ D) Neuropsychological testing
- ☐ E) Omega-3 acid ethyl ester supplementation

Correct Answer: A.

Attention-deficit/hyperactivity disorder (ADHD) presents with chronic symptoms of hyperactivity/impulsivity and/or inattention that occur in more than one setting and impair academic, social, and/or emotional function. Stimulants, which include amphetamine salts and methylphenidate, are first-line agents that increase synaptic dopamine and norepinephrine. Common adverse effects include appetite suppression, anxiety, insomnia, and headaches. Patients also commonly experience mild increases in heart rate and blood pressure. There have been a few reports of sudden cardiac deaths, though larger studies have not shown an increased risk. Even so, it is prudent to gather a thorough cardiac history, family cardiac history, and physical examination. If cardiac concerns are identified (eg, this patient's family history of sudden cardiac death at a young age), further cardiac testing including an ECG should be considered. Notably, it is not necessary to obtain a routine ECG prior to initiating stimulant therapy in patients without these cardiac risk factors.

Incorrect Answers: B, C, D, and E.

EEG (Choice B) is not routinely indicated prior to stimulant therapy initiation. The evidence is inconclusive about whether stimulant therapy increases seizure risk.

Increased frequency of cognitive behavioral therapy sessions (Choice C) is less likely to lead to ADHD symptom improvement compared with initiating stimulant therapy. Stimulant therapy is the preferred treatment modality for patients older than 6 years.

Neuropsychological testing (Choice D) is not needed for routine screening or diagnostic confirmation of ADHD. Behavioral rating scales filled out by parents and teachers suffice. As well, this patient has an established ADHD diagnosis.

Omega-3 acid ethyl ester supplementation (Choice E) is not indicated. Studies have been mixed on whether fatty acid supplementation can improve ADHD symptoms.

Educational Objective: Stimulant therapy has been rarely associated with sudden cardiac death in children. Though ECG is not routinely indicated prior to stimulant initiation, it should be considered for patients with risk factors such as a family history of sudden cardiac death.



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33. A 21-year-old woman is brought to the emergency department because of a 3-day history of vomiting and malaise and a 6-day history of abdominal cramping. One week ago, she had a medically induced abortion at 44 days' gestation, with use of oral mifepristone and vaginal misoprostol. She has no history of serious illness and takes no medications. She follows a vegetarian diet. She appears ill. Temperature is 39.0°C (102.0°F), pulse is 151/min, respirations are 32/min, and blood pressure is 89/56 mm Hg. Physical examination discloses coarse breath sounds, a soft, nondistended abdomen, and 1+ pitting edema. Results of laboratory studies are shown:

Hemoglobin	16 g/dL
Hematocrit	49%
Leukocyte count	39,500/mm ³
Platelet count	498,810/mm ³
Serum	
Na ⁺	135 mEq/L
K ⁺	4.9 mEq/L
Cl ⁻	104 mEq/L
HCO ₃ ⁻	17 mEq/L
Urea nitrogen	25 mg/dL
Glucose [2-h postprandial]	99 mg/dL
Creatinine	1.8 mg/dL

Blood cultures grow gram-positive rods. Which of the following infectious agents is the most likely cause of these findings?

- ☐ A) *Actinomyces meyeri*
- ☐ B) *Bacillus cereus*
- ☒ C) *Clostridium sordellii*
- ☐ D) *Erysipelothrix rhusiopathiae*



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Correct Answer: C.

Clostridium sordellii is a gram-positive, anaerobic bacterium that belongs to the genus *Clostridium*. While it is a relatively uncommon pathogen, it has gained attention in recent years because of its association with severe infections, particularly in the context of medical abortion using mifepristone and misoprostol. *C. sordellii* infections associated with medical abortion are rare but can be life-threatening. The exact mechanism by which *C. sordellii* causes infection in this context is not fully understood. One of the concerning aspects of *C. sordellii* infection is its ability to produce potent toxins, including lethal toxin and hemorrhagic toxin, which can cause severe systemic effects such as toxic shock syndrome and necrotizing fasciitis. Symptoms of *C. sordellii* infection may include fever, abdominal pain, nausea, vomiting, diarrhea, and rapid onset of shock. However, the clinical presentation can be variable, and some patients may initially appear relatively stable before rapidly deteriorating.

Incorrect Answers: A, B, D, and E.

Actinomyces meyeri (Choice A) is not the most likely pathogen. *A. meyeri* is not associated with septicemia in patients who undergo medical abortion. Additionally, Gram stain would show a gram-positive branching organism, rather than rods.

Bacillus cereus (Choice B) is a gram-positive bacillus that is commonly implicated in cases of food poisoning. While this patient is having vomiting, malaise, and abdominal cramping, the duration of 6 days is longer than would be expected for this ailment, and it would be grossly abnormal to see a patient with a leukocyte count of almost 40,000/mm³.

Erysipelothrix rhusiopathiae (Choice D) is a gram-positive, filamentous rod-shaped organism that is most commonly seen with localized skin infections. The development of sepsis from this bacterium would be unlikely.

Nocardia brasiliensis (Choice E) is a gram-positive branching rod that is associated most commonly with pulmonary nocardiosis. These patients present with cough, fever, chest pain, and difficulty breathing. Severe vomiting and sepsis would be unexpected.

Educational Objective: *Clostridium sordellii*, a gram-positive anaerobic bacterium, is an infrequently encountered but notable concern in medical abortion cases. Its ability to produce potent toxins, including lethal and hemorrhagic toxins, can lead to life-threatening systemic effects such as toxic shock syndrome and necrotizing fasciitis. Symptoms of *C. sordellii* infection, including fever, abdominal pain, and rapid onset of shock, may vary, with some patients initially presenting as stable before rapidly deteriorating.



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- ✓ 34. A 65-year-old woman is admitted to the hospital because of a 1-day history of fever, and edema and erythema of the right arm. She says that overnight her right arm began throbbing and the redness worsened. She also had chills and increasingly severe arm pain throughout the night. Her temperature reached 38.9°C (102°F) at home. One year ago, she had stage II breast cancer treated with right partial mastectomy, lymphadenectomy, and radiation therapy. She was treated with a compression sleeve for lymphedema of the right upper extremity postoperatively. She has osteoarthritis of the shoulders and hands, which limits the use of her upper extremities. She says her symptoms have always been present since the operation, but the swelling has worsened since yesterday. Her temperature is 38.3°C (101°F), pulse is 88/min, respirations are 14/min, and blood pressure is 150/80 mm Hg. Examination shows a bright red, well-demarcated area from 3 cm below the elbow to 3 cm above the ulnar prominence; it is exquisitely tender to light touch. The patient has moderate tenderness to palpation of the right upper extremity. There are no open areas over the skin or fingers. Laboratory studies show:

Hemoglobin	11.4 g/dL
Hematocrit	35%
Mean corpuscular volume	82 μm^3
Leukocyte count	19,200/ mm^3
Platelet count	260,000/ mm^3

Which of the following is the most likely infectious agent?

- ☐ A) *Candida albicans*
- ☐ B) *Escherichia coli*
- ☐ C) Methicillin-resistant *Staphylococcus aureus*
- ☐ D) *Pseudomonas aeruginosa*
- ☒ E) *Streptococcus pyogenes* (group A)



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The most common causative organism leading to the development of erysipelas is *Streptococcus pyogenes* (group A). Erysipelas clinically presents with warm, indurated, tender, well-defined/demarcated, erythematous patches or plaques that may develop overlying pustules or vesicles. It most commonly occurs on a lower extremity but may appear elsewhere, such as the face or an upper extremity, as seen in this patient. Risk factors include chronic edema and lymphedema. Patients with erysipelas can present with systemic findings including fevers, chills, and leukocytosis. Treatment includes oral antibiotics for mild cases or intravenous antibiotics for severe cases. A regimen that covers both *Streptococcus* and *Staphylococcus* species (eg, cephalexin, doxycycline, clindamycin) is often chosen, as there are many common causative pathogens.

Incorrect Answers: A, B, C, and D.

Candida albicans (Choice A) is a common cause of diaper dermatitis in infants, thrush in immunosuppressed patients, and vulvovaginitis. In mucocutaneous candida infections, topical agents including clotrimazole or nystatin are used, whereas fluconazole may be used for severe or refractory cases. While *C. albicans* infection is common, it is not associated with the development of erysipelas.

Escherichia coli (Choice B) is a common cause of urinary tract infections. Signs of urinary tract infection include pain with urination, increased urge to urinate, pyuria, and hematuria. In some cases, urinary tract infections can progress to pyelonephritis and septic shock in severe cases. In patients with suspected urinary tract infection, a urine culture should be obtained prior to initiation of antibiotics. *E. coli* is not a common cause of erysipelas.

Methicillin-resistant *Staphylococcus aureus* (MRSA) (Choice C) is a common cause of soft tissue infections in hospitalized patients and is associated with community-acquired infections. Providers should maintain a high index of suspicion for MRSA in patients who develop skin and soft tissue infections. Although MRSA may cause erysipelas, *S. pyogenes* (group A) is the most likely causative organism. An antibiotic regimen that targets both organisms is often chosen.

Pseudomonas aeruginosa (Choice D) is a gram-negative bacterium that commonly causes severe infections in immunosuppressed patients, patients with diabetes, and critically ill patients. *Pseudomonas* species can cause malignant otitis externa, cutaneous infection in traumatic puncture wounds, hospital-acquired pneumonia, and septic shock. Common antibiotic regimens used to treat *P. aeruginosa* include intravenous piperacillin-tazobactam, cefepime, or meropenem.

Educational Objective: Erysipelas clinically presents with warm, indurated, tender, demarcated, erythematous patches. *Streptococcus pyogenes* (group A) is the most common causative organism implicated in the development of erysipelas. Risk factors include chronic edema and lymphedema. Empiric antibiotic regimens often target both *Streptococcus* and *Staphylococcus* species.



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35. A 22-year-old woman comes to the clinic because her sexual partner told her that he was treated for *Chlamydia trachomatis* infection 1 week ago. They have not had sexual intercourse since he was treated. She has been sexually active and monogamous with this partner for 2 months and uses a vaginal contraceptive ring correctly and condoms inconsistently. The patient was treated for *C. trachomatis* infection 4 months ago, but she did not return for follow-up testing for reinfection. She has no other history of serious illness and currently takes no medications. Physical examination, including pelvic examination, shows no abnormalities. Testing for *C. trachomatis* is done. Which of the following is the most appropriate next step in management?

- ☒ A) Azithromycin therapy now
- ☐ B) Cefixime therapy now
- ☐ C) Clindamycin therapy now
- ☐ D) Contact the partner's physician to confirm treatment
- ☐ E) Withhold treatment until patient's test results are available

Correct Answer: A.

Sexually transmitted infections secondary to *Chlamydia trachomatis* and *Neisseria gonorrhoeae* can cause vaginitis, cervicitis, and pelvic inflammatory disease. Vaginitis typically presents with discharge and pruritus. Cervicitis presents with similar discharge, but also with an erythematous, friable cervix and cervical motion tenderness on examination. When infection spreads to the fallopian tubes and ovaries, pelvic inflammatory disease can result, which presents with cervical motion tenderness, purulent cervical discharge, uterine and adnexal tenderness, and systemic signs and symptoms such as fever, fatigue, nausea, and myalgias. Complications include tubo-ovarian or intra-abdominal abscess. This patient presents asymptotically, though she reports her current sexual partner was diagnosed with *C. trachomatis*. Because of a prior history of infection and treatment for *C. trachomatis*, this patient should be tested and treated for infection from this organism. Typically, diagnosis is made with a nucleic acid amplification test. Treatment consists of either azithromycin or doxycycline in combination with ceftriaxone, with the latter covering a potential *N. gonorrhoeae* coinfection.

Incorrect Answers: B, C, D, and E.

Cefixime therapy now (Choice B) is typically used to treat infection with *N. gonorrhoeae* (if susceptible) and other various infections such as bronchitis and urinary tract



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Correct Answer: A.

Sexually transmitted infections secondary to *Chlamydia trachomatis* and *Neisseria gonorrhoeae* can cause vaginitis, cervicitis, and pelvic inflammatory disease. Vaginitis typically presents with discharge and pruritus. Cervicitis presents with similar discharge, but also with an erythematous, friable cervix and cervical motion tenderness on examination. When infection spreads to the fallopian tubes and ovaries, pelvic inflammatory disease can result, which presents with cervical motion tenderness, purulent cervical discharge, uterine and adnexal tenderness, and systemic signs and symptoms such as fever, fatigue, nausea, and myalgias. Complications include tubo-ovarian or intra-abdominal abscess. This patient presents asymptotically, though she reports her current sexual partner was diagnosed with *C. trachomatis*. Because of a prior history of infection and treatment for *C. trachomatis*, this patient should be tested and treated for infection from this organism. Typically, diagnosis is made with a nucleic acid amplification test. Treatment consists of either azithromycin or doxycycline in combination with ceftriaxone, with the latter covering a potential *N. gonorrhoeae* coinfection.

Incorrect Answers: B, C, D, and E.

Cefixime therapy now (Choice B) is typically used to treat infection with *N. gonorrhoeae* (if susceptible), and other various infections such as bronchitis and urinary tract infections. It would not appropriately treat this patient's exposure to *C. trachomatis*.

Clindamycin therapy now (Choice C) would not be appropriate to treat this patient's exposure to *C. trachomatis*. It is otherwise used for a variety of bacterial infections, for both treatment and prophylaxis.

Contact the partner's physician to confirm treatment (Choice D) is unnecessary as this patient has presented trustworthy information to the clinician to allow for appropriate assessment and treatment.

Withhold treatment until patient's test results are available (Choice E) is not necessary as this patient has a prior history of infection from *C. trachomatis* and has a known exposure. This combination makes treatment prior to test results appropriate to avoid consequences of an infection.

Educational Objective: Sexually transmitted infections secondary to *Chlamydia trachomatis* and *Neisseria gonorrhoeae* can cause vaginitis, cervicitis, and pelvic inflammatory disease. Diagnosis is via nucleic acid amplification test, and treatment consists of either azithromycin or doxycycline in combination with ceftriaxone, with the latter covering a potential *N. gonorrhoeae* coinfection.



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- ✓ 36. A 57-year-old man comes to the office because of a 3-week history of generalized itchiness and yellow eyes. He has not had abdominal pain, fever, or night sweats. He has no history of serious illness and takes no medications. He smoked two packs of cigarettes daily for 20 years but quit 17 years ago. Vital signs are within normal limits. Examination shows conjunctival icterus. The abdomen is soft and nontender; there are no masses. A CT scan of the abdomen and pelvis shows a 3-cm mass at the head of the pancreas and dilated common bile and intrahepatic bile ducts. Endoscopic retrograde cholangiopancreatography (ERCP) shows no mucosal abnormality. A stent is placed in the common bile duct. Results of bile culture and cytology are negative. Results of a fine-needle biopsy of the mass show no abnormalities. Which of the following is the most appropriate next step in management?
- ☒ A) Endoscopy-guided biopsy
 - ☐ B) HIDA scan
 - ☐ C) Repeat abdominal and pelvic CT scan in 3 months
 - ☐ D) Repeat ERCP in 3 months
 - ☐ E) Serum carcinoembryonic antigen assay

Correct Answer: A.

Pancreatic adenocarcinoma most commonly occurs in the pancreatic head. It is often initially characterized by nonspecific vague abdominal discomfort or weight loss. As the pancreatic mass increases in size, it can lead to the obstruction and dilation of both the common bile duct and main pancreatic duct. This can result in painless jaundice and/or pancreatitis from obstruction of these ducts. If the pancreatic adenocarcinoma continues to spread and results in infiltration of surrounding abdominal viscera, and/or encasement of adjacent neurovascular structures, this can manifest with severe abdominal pain. The nonspecific nature of pancreatic adenocarcinoma's early symptoms creates a diagnostic dilemma, as many benign conditions present similarly. It is frequently asymptomatic until it creates an obstruction, gastrointestinal dysfunction, perineural or vascular encasement/invasion, or metastatic disease. Initial diagnosis is made with CT scan or MRI of the abdomen, which can elucidate the cause of biliary duct obstruction and the extent of pancreatic cancer. Endoscopy-guided biopsy can be used for the evaluation of suspicious pancreatic masses or submucosal gastrointestinal masses. Endoscopy-guided biopsies typically use ultrasonography to precisely identify the location of masses in the pancreatic head/neck region. This allows for accurate tissue sampling, decreasing the risk for false-negative biopsy results.

Incorrect Answers: B, C, D, and E.



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Correct Answer: A.

Pancreatic adenocarcinoma most commonly occurs in the pancreatic head. It is often initially characterized by nonspecific vague abdominal discomfort or weight loss. As the pancreatic mass increases in size, it can lead to the obstruction and dilation of both the common bile duct and main pancreatic duct. This can result in painless jaundice and/or pancreatitis from obstruction of these ducts. If the pancreatic adenocarcinoma continues to spread and results in infiltration of surrounding abdominal viscera, and/or encasement of adjacent neurovascular structures, this can manifest with severe abdominal pain. The nonspecific nature of pancreatic adenocarcinoma's early symptoms creates a diagnostic dilemma, as many benign conditions present similarly. It is frequently asymptomatic until it creates an obstruction, gastrointestinal dysfunction, perineural or vascular encasement/invasion, or metastatic disease. Initial diagnosis is made with CT scan or MRI of the abdomen, which can elucidate the cause of biliary duct obstruction and the extent of pancreatic cancer. Endoscopy-guided biopsy can be used for the evaluation of suspicious pancreatic masses or submucosal gastrointestinal masses. Endoscopy-guided biopsies typically use ultrasonography to precisely identify the location of masses in the pancreatic head/neck region. This allows for accurate tissue sampling, decreasing the risk for false-negative biopsy results.

Incorrect Answers: B, C, D, and E.

HIDA scan (Choice B) is used for the diagnosis of acute cholecystitis. If there is lack of visualization of the gallbladder after administration of the radioactive tracer, this indicates the presence of acute cholecystitis with blockage of the cystic duct secondary to an impacted, nonmobile gallstone. Cholecystitis presents acutely with right upper quadrant pain, nausea, and vomiting. This patient has chronic symptoms, and because cholecystitis does not cause obstruction of the common bile duct, it would not typically present with jaundice.

Repeat abdominal and pelvic CT scan in 3 months (Choice C) or repeat ERCP in 3 months (Choice D) is inappropriate as pancreatic cancer is highly aggressive and, if suspected, diagnosis and treatment should be started as soon as possible.

Serum carcinoembryonic antigen assay (Choice E) is useful as a tumor marker to measure response to treatment in particular types of gastrointestinal carcinoma. It is not appropriate as a diagnostic test because of its low sensitivity and specificity.

Educational Objective: Pancreatic adenocarcinoma can cause weight loss and typically painless jaundice via obstruction of biliary ducts. Initial diagnosis is made with CT scan or MRI of the abdomen. Endoscopy-guided biopsy is the most accurate method for tissue sampling of suspicious pancreatic head/neck masses and confirming the diagnosis.



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- ✓ 37. An 18-year-old man is brought to the emergency department by paramedics 20 minutes after he sustained a gunshot wound to his head. En route to the hospital, he was intubated, mechanically ventilated, and administered 2 L of intravenous 0.9% saline. On arrival, he is unresponsive. His Glasgow Coma Scale score is 3. Examination shows fixed and dilated pupils. Findings of brain death are confirmed by a neurosurgeon and trauma surgeon. The most appropriate person to approach this patient's family about organ donation is which of the following?
- ☐ A) The neurosurgeon
 - ☐ B) A pastoral care representative
 - ☒ C) A representative from the organ procurement organization
 - ☐ D) A representative from the transplant team
 - ☐ E) The trauma surgeon

Correct Answer: C.

A representative from the organ procurement organization is the most appropriate person to approach this patient's family about organ donation. The existence of organ procurement organizations provides third-party representatives that separate clinicians caring for potential organ donors from clinicians caring for potential organ recipients. This separation decreases the possibility of a conflict of interest and maintains the public's trust in the medical system. Organ procurement organizations are nonprofit organizations mandated by federal law to coordinate organ donation in a designated region of the country.

Incorrect Answers: A, B, D, and E.

The neurosurgeon (Choice A) and the trauma surgeon (Choice E) have potential fiduciary duties to this recently deceased patient and are less appropriate than a third-party representative from an organ procurement organization to approach the patient's family about organ donation. A pastoral care representative (Choice B) commonly provides support to families of dying or recently deceased patients. Inquiring about organ donation does not align with this provision of support. A representative from the transplant team (Choice D) has a fiduciary duty to potential transplant recipients and does not typically interface with the families of other patients. Organ procurement organizations are best positioned to approach patients' families about organ donation.

Examination shows fixed and dilated pupils. Findings of brain death are confirmed by a neurosurgeon and trauma surgeon. The most appropriate person to approach this patient's family about organ donation is which of the following?

- ☐ A) The neurosurgeon
- ☐ B) A pastoral care representative
- ☒ C) A representative from the organ procurement organization
- ☐ D) A representative from the transplant team
- ☐ E) The trauma surgeon

Correct Answer: C.

A representative from the organ procurement organization is the most appropriate person to approach this patient's family about organ donation. The existence of organ procurement organizations provides third-party representatives that separate clinicians caring for potential organ donors from clinicians caring for potential organ recipients. This separation decreases the possibility of a conflict of interest and maintains the public's trust in the medical system. Organ procurement organizations are nonprofit organizations mandated by federal law to coordinate organ donation in a designated region of the country.

Incorrect Answers: A, B, D, and E.

The neurosurgeon (Choice A) and the trauma surgeon (Choice E) have potential fiduciary duties to this recently deceased patient and are less appropriate than a third-party representative from an organ procurement organization to approach the patient's family about organ donation. A pastoral care representative (Choice B) commonly provides support to families of dying or recently deceased patients. Inquiring about organ donation does not align with this provision of support. A representative from the transplant team (Choice D) has a fiduciary duty to potential transplant recipients and does not typically interface with the families of other patients. Organ procurement organizations are best positioned to approach patients' families about organ donation.

Educational Objective: Organ procurement organizations are nonprofit organizations mandated by federal law to coordinate organ donation. These organizations provide third-party representatives that relieve clinicians caring for transplant donors and clinicians caring for transplant recipients from conflicts of interest.



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✓ 38. A 42-year-old woman who underwent an endoscopic sinus operation 30 minutes ago has the sudden onset of tachycardia and hypotension. The procedure was completed under general anesthesia without complications, and estimated blood loss was 25 mL. She has a 10-year history of asthma treated with oral prednisone. She is awake and responsive. Her temperature is 38.1°C (100.5°F), pulse is 120/min and regular, respirations are 18/min, and blood pressure is 75/50 mm Hg. Pulse oximetry on 2 L/min of oxygen by nasal cannula shows an oxygen saturation of 90%. Examination shows no abnormalities. An ECG shows sinus tachycardia with no acute ST-segment changes. In addition to administration of intravenous fluids, which of the following is the most appropriate next step in management?

- ☐ A) Arterial blood gas analysis
- ☐ B) Chest x-ray
- ☐ C) Determination of hematocrit
- ☐ D) Intravenous administration of ephedrine
- ☒ E) Intravenous administration of hydrocortisone

Correct Answer: E.

Immediate initiation of corticosteroid therapy is the most appropriate next step in management for this patient suffering hemodynamic collapse due to adrenal crisis. Chronic use of exogenous corticosteroids (such as for the management of asthma) results in decreased production of adrenocorticotrophic hormone from the pituitary gland, leading to subsequent atrophy of the bilateral adrenal glands and diminished native production of corticosteroids. Adrenal crisis can be precipitated by a physiologic stressor (eg, surgery, trauma, infection) that acutely increases the body's demand for corticosteroids, which cannot be met due to chronic adrenal gland atrophy. Adrenal insufficiency presents with hypoglycemia, altered mental status, hyponatremia, tachycardia, and abnormal vasodilation. Adrenal crisis is marked by significant volume depletion and fluid- and vasopressor-refractory hypotension. While difficult to diagnose because of its nonspecific presentation, acute adrenal crisis should be considered in the differential of any patient presenting with circulatory collapse. Treatment requires the administration of intravenous corticosteroids to improve systemic vascular resistance and restore hemodynamic stability.

Incorrect Answers: A, B, C, and D.



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Correct Answer: E.

Immediate initiation of corticosteroid therapy is the most appropriate next step in management for this patient suffering hemodynamic collapse due to adrenal crisis. Chronic use of exogenous corticosteroids (such as for the management of asthma) results in decreased production of adrenocorticotrophic hormone from the pituitary gland, leading to subsequent atrophy of the bilateral adrenal glands and diminished native production of corticosteroids. Adrenal crisis can be precipitated by a physiologic stressor (eg, surgery, trauma, infection) that acutely increases the body's demand for corticosteroids, which cannot be met due to chronic adrenal gland atrophy. Adrenal insufficiency presents with hypoglycemia, altered mental status, hyponatremia, tachycardia, and abnormal vasodilation. Adrenal crisis is marked by significant volume depletion and fluid- and vasopressor-refractory hypotension. While difficult to diagnose because of its nonspecific presentation, acute adrenal crisis should be considered in the differential of any patient presenting with circulatory collapse. Treatment requires the administration of intravenous corticosteroids to improve systemic vascular resistance and restore hemodynamic stability.

Incorrect Answers: A, B, C, and D.

Arterial blood gas analysis (Choice A) will give information about the patient's current acid-base status. However, in the setting of a patient taking long-term corticosteroids, this information is minimally useful when an adrenal crisis is the most likely cause. An arterial blood gas analysis would further delay corrective measures to treat this patient's condition.

Chest x-ray (Choice B) is not appropriate in this patient. A chest x-ray could offer information regarding whether the patient has developed a pneumothorax or other pulmonary complications. However, it would not offer any insight into why she has hemodynamic instability and is febrile.

Determination of hematocrit (Choice C) is not appropriate. While hypovolemia due to blood loss from surgery should be considered in any patient, this patient underwent endoscopic sinus surgery with a blood loss of 25 mL. This would not lead to the instability seen in this patient's presentation.

Intravenous administration of ephedrine (Choice D) would not be appropriate for this patient. While ephedrine is both α - and β -adrenergic agonistic, patients in adrenal crisis are often refractory to vasopressor therapy. This does not address the underlying pathophysiology of their distress.

Educational Objective: An adrenal crisis is a medical emergency resulting in refractory hypotension and circulatory collapse due to the inadequate availability of endogenous or exogenous corticosteroids to meet physiologic demands. Patients who require long durations of corticosteroid therapy are at risk for adrenal gland atrophy and adrenal crisis in the setting of an acute stressor. Treatment requires the administration of intravenous corticosteroids to improve systemic vascular resistance and restore hemodynamic stability.



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39. A 32-year-old woman comes to the office because of a painless mass in the right side of her neck that she first noticed 2 months ago. The mass has not increased in size since she first saw it, and she reports no other masses. Medical history is unremarkable, and she takes no medications. She is 170 cm (5 ft 7 in) tall and weighs 57 kg (125 lb); BMI is 20 kg/m². Vital signs are within normal limits. Examination shows a 2-cm mass in the right upper lobe of the thyroid gland. There is no lymphadenopathy. Which of the following is the most appropriate next step in evaluation?

- ☐ A) CT scan of the chest
- ☐ B) CT scan of the neck
- ☒ C) Fine-needle aspiration biopsy of the mass
- ☐ D) Ultrasonography of the thyroid gland
- ☐ E) Whole-body PET scan

Correct Answer: D.

The differential diagnosis for a chronic, nontender, otherwise asymptomatic neck mass can be refined based on the location and the characteristics of the mass itself. In this case, a nontender mass located on the right side of the neck that has not changed in size likely represents a thyroid nodule. While thyroid nodules may be benign areas of hyperplastic overgrowth, malignancy (eg, papillary thyroid carcinoma) must be ruled out. Such masses may also be cystic, infectious, or inflammatory in nature, though neoplasia is the more likely cause. The absence of lymphadenopathy in this case argues against both infectious causes and dissemination of any neoplastic cause. The first step in the evaluation of a thyroid nodule is ultrasonography of the thyroid gland to better characterize the mass. Based on the results of this, further workup and management is dictated by the characteristics of the mass.

Incorrect Answers: A, B, C, and E.

CT scan of the chest (Choice A) is not the most appropriate next step in the management of this patient. Given that this patient's mass is located in her neck, and not in her chest, this location of the CT scan would not be appropriate. Additionally, a CT scan is not the modality of choice to evaluate thyroid nodules.

CT scan of the neck (Choice B) is not the most appropriate next step. A CT scan of the neck would expose this patient to excess concentrations of radiation unnecessarily.



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☐ E) Whole-body PET scan

Correct Answer: D.

The differential diagnosis for a chronic, nontender, otherwise asymptomatic neck mass can be refined based on the location and the characteristics of the mass itself. In this case, a nontender mass located on the right side of the neck that has not changed in size likely represents a thyroid nodule. While thyroid nodules may be benign areas of hyperplastic overgrowth, malignancy (eg, papillary thyroid carcinoma) must be ruled out. Such masses may also be cystic, infectious, or inflammatory in nature, though neoplasia is the more likely cause. The absence of lymphadenopathy in this case argues against both infectious causes and dissemination of any neoplastic cause. The first step in the evaluation of a thyroid nodule is ultrasonography of the thyroid gland to better characterize the mass. Based on the results of this, further workup and management is dictated by the characteristics of the mass.

Incorrect Answers: A, B, C, and E.

CT scan of the chest (Choice A) is not the most appropriate next step in the management of this patient. Given that this patient's mass is located in her neck, and not in her chest, this location of the CT scan would not be appropriate. Additionally, a CT scan is not the modality of choice to evaluate thyroid nodules.

CT scan of the neck (Choice B) is not the most appropriate next step. A CT scan of the neck would expose this patient to excess concentrations of radiation unnecessarily and is not the imaging modality of choice when evaluating the thyroid.

Fine-needle aspiration biopsy of the mass (Choice C) is not the most appropriate next step. Fine-needle aspiration biopsy is an important step in the definitive diagnosis of a thyroid mass, but it is not performed before ultrasonography. Many thyroid masses, particularly thyroid cysts, are benign and do not require fine-needle aspiration biopsy, which does pose a risk for infection or bleeding.

Whole-body PET scan (Choice E) is not appropriate for this patient. A whole-body PET scan is used to identify distant metastases when a primary malignancy has been identified. Given that this patient has not had other imaging, such as ultrasonography, or fine-needle aspiration to evaluate her neck mass, a PET scan would be inappropriate.

Educational Objective: Thyroid nodules may be inflammatory, infectious, cystic, or neoplastic, with malignancy representing an important diagnosis to be excluded. The initial workup consists of an ultrasonography evaluation of the mass to determine whether it has malignant versus benign features.



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40. A 10-year-old boy is brought to the office by his mother for a well-child examination. He has no history of serious illness and receives no medications. He is in no distress. He is at the 75th percentile for height, 50th percentile for weight, and 20th percentile for BMI. Vital signs are within normal limits. On cardiac examination, a mid-systolic ejection murmur is heard best at the left sternal border; there is an S_4 . No other abnormalities are noted. Echocardiography is most likely to show which of the following?

- ☐ A) Defect of the ventricular septum
- ☒ B) Hypertrophy of the left ventricle
- ☐ C) Impaired contraction of the right ventricle
- ☐ D) Myxoma of the tricuspid valve
- ☐ E) Regurgitant flow across the aortic valve
- ☐ F) Stenosis of the mitral valve

Correct Answer: B.

This young, otherwise healthy patient with a mid-systolic murmur and an S_4 may have hypertrophy of the left ventricle, suggestive in his age group of hypertrophic obstructive cardiomyopathy. This condition, which is suspected to have autosomal dominant inheritance, results in hypertrophy of myocytes leading to a focal obstruction in the left ventricular outflow tract (LVOT). It classically presents with syncope or sudden cardiac death in an otherwise healthy, young athlete. As a result of the narrowed LVOT, any hemodynamic influence that prevents the stenting open of the tract (eg, low preload leading to low stroke volume due to Valsalva maneuver, standing, or hypovolemia) will result in an exacerbation of the murmur because of increased turbulent blood flow. Significant derangements in hemodynamics can cause complete obstruction of the LVOT, commonly causing obstruction by abnormal motion of the mitral valve. Resultant reduction in cardiac output leads to syncope. Arrhythmogenic foci are also a common cause of mortality.

Incorrect Answers: A, C, D, E, and F.

Defect of the ventricular septum (Choice A) is a relatively common form of congenital heart disease. While ventricular septal defects may be clinically silent if small, they



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the left ventricular outflow tract (LVOT). It classically presents with syncope or sudden cardiac death in an otherwise healthy, young athlete. As a result of the narrowed LVOT, any hemodynamic influence that prevents the stenting open of the tract (eg, low preload leading to low stroke volume due to Valsalva maneuver, standing, or hypovolemia) will result in an exacerbation of the murmur because of increased turbulent blood flow. Significant derangements in hemodynamics can cause complete obstruction of the LVOT, commonly causing obstruction by abnormal motion of the mitral valve. Resultant reduction in cardiac output leads to syncope. Arrhythmogenic foci are also a common cause of mortality.

Incorrect Answers: A, C, D, E, and F.

Defect of the ventricular septum (Choice A) is a relatively common form of congenital heart disease. While ventricular septal defects may be clinically silent if small, they can result in progressive right ventricular overload and heart failure if large. Auscultation frequently shows a holosystolic murmur at the left sternal border, and they are generally present from birth.

Impaired contraction of the right ventricle (Choice C) can occur in multiple conditions, including pulmonic stenosis or pulmonary hypertension. Such conditions present with signs of right heart failure, including peripheral edema and hepatomegaly. The murmur pattern may include a loud S_2 , and/or a systolic crescendo-decrescendo murmur in the pulmonic auscultation area if pulmonic stenosis is present.

Myxoma of the tricuspid valve (Choice D) is a rare location for a cardiac myxoma to occur; they most often occur within the atria. When present, signs of right heart failure and tricuspid stenosis or regurgitation depending on the location and movement of the tumor may be detected. These include systolic and diastolic murmurs in the tricuspid listening area, peripheral edema, and hepatomegaly.

Regurgitant flow across the aortic valve (Choice E), known as aortic insufficiency, presents with an early diastolic decrescendo murmur best heard in the right second intercostal space. A widened pulse pressure may be present.

Stenosis of the mitral valve (Choice F) presents with a murmur heard as an opening snap followed by a diastolic rumble, loudest over the cardiac apex and radiating to the axilla. It may follow acute rheumatic fever in children.

Educational Objective: Hypertrophic obstructive cardiomyopathy results in hypertrophy of myocytes leading to a focal obstruction in the left ventricular outflow tract. It classically presents with syncope or sudden cardiac death. Systolic ejection murmurs and murmurs for which the character changes with medications or maneuvers that alter preload and afterload are characteristic.



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- ✓ 41. A 25-year-old woman comes to the office for a follow-up examination 4 weeks after being diagnosed with HIV infection. She feels well. She used intravenous drugs for 5 years but stopped 2 years ago. She has been sexually active with one male partner during the past year; they use condoms consistently. Results of PPD skin testing 6 months ago were negative. She has no other history of serious illness and takes no medications. Her pulse is 68/min, respirations are 14/min, and blood pressure is 105/60 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 98%. Examination shows no abnormalities. Laboratory studies show:

Hemoglobin	14 g/dL
Hematocrit	42%
Leukocyte count	9000/mm ³
Platelet count	350,000/mm ³
Serum	
Glucose	90 mg/dL
Creatinine	0.8 mg/dL
Total bilirubin	0.5 mg/dL
Alkaline phosphatase	50 U/L
AST	35 U/L
ALT	35 U/L

Which of the following is the most appropriate next step in diagnosis?

- ☐ A) Chest x-ray
- ☐ B) CT scan of the head
- ☐ C) Determination of hemoglobin A_{1c}
- ☒ D) Hepatitis B surface antigen assay
- ☐ E) Varicella-zoster virus polymerase chain reaction test

- ☒ D) Hepatitis B surface antigen assay
- ☐ E) Varicella-zoster virus polymerase chain reaction test

Correct Answer: D.

HIV is an enveloped, single-stranded RNA virus of the retrovirus family that causes AIDS. An acute HIV infection commonly presents with febrile illness that resolves spontaneously. Eventually, as the virus infects and decreases the CD4+ T-lymphocyte count, patients may develop signs and symptoms of opportunistic infections. In cases of newly diagnosed HIV, workup includes routine serum chemistry testing to evaluate hepatic and renal function, as this may direct future treatment, as well as screening for coinfections of viral hepatitis, tuberculosis, and other sexually transmitted infections. In this case, ordering a hepatitis B surface antigen assay would be the most appropriate next step in diagnosis to evaluate for a possible coinfection.

Incorrect Answers: A, B, C, and E.

Chest x-ray (Choice A) may be used to monitor or screen for tuberculosis, especially in those who have had a positive tuberculin (also known as PPD) skin test, positive blood test, or have been exposed to someone known to have tuberculosis. In this case, the patient had a negative tuberculin skin test 6 months ago. A hepatitis B surface antigen assay would be the most appropriate next step in diagnosis in this case.

CT scan of the head (Choice B) is not indicated in this case. In cases of newly diagnosed HIV, screening for coinfections would be the most appropriate next step in diagnosis.

Determination of hemoglobin A_{1c} (Choice C) may be a reasonable diagnostic step in patients newly diagnosed with HIV who have baseline metabolic abnormalities. However, screening for coinfections would be the most appropriate next step in diagnosis for this patient.

Varicella-zoster virus polymerase chain reaction test (Choice E) is used to confirm a diagnosis of varicella-zoster virus infection. Varicella-zoster is not a routine coinfection that is evaluated for in newly diagnosed cases of HIV.

Educational Objective: HIV is an enveloped, single-stranded RNA virus of the retrovirus family that causes AIDS. Patients newly diagnosed with HIV should undergo routine serum chemistry testing to evaluate hepatic and renal function, as this may direct future treatment. In addition, patients should also be screened for coinfections of tuberculosis, viral hepatitis, and other sexually transmitted infections.



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42. An 82-year-old woman with hypertension comes to the office because of a 2-month history of easy fatigability and shortness of breath with mild exertion. She says she has to use two pillows **s to sleep** and breathe comfortably. She had a myocardial infarction at the age of 75 years. Her medications are hydrochlorothiazide, fosinopril, and potassium supplementation. She has never smoked cigarettes. Her pulse is 100/min, and blood pressure is 150/100 mm Hg. Crackles are heard at the lung bases bilaterally. There is pitting edema of the lower extremities. No other abnormalities are noted. Which of the following is the most likely set of findings in this patient?

	Sympathetic Tone	Renal Blood Flow	Urine Sodium Concentration
<input type="radio"/> A)	Decreased	decreased	increased
<input type="radio"/> B)	Decreased	increased	increased
<input checked="" type="radio"/> C)	Increased	decreased	decreased
<input type="radio"/> D)	Increased	decreased	increased
<input type="radio"/> E)	Increased	increased	decreased

Correct Answer: C.

The patient is presenting with signs and symptoms of heart failure, such as exertional fatigue, shortness of breath, orthopnea, pulmonary crackles, and peripheral edema. Heart failure is a common complication of ischemic heart disease and hypertension. Renal blood flow is decreased, resulting in activation of the renin-angiotensin-aldosterone system because of decreased cardiac output that arises from heart failure. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension (increased sympathetic tone). Angiotensin II also leads to increased Na^+ reabsorption in the renal tubules, and aldosterone release by the adrenal cortex with subsequent increased Na^+ resorption and fluid retention among other effects. The net result of decreased renal blood flow and activation of the renin-angiotensin-aldosterone system includes increased sympathetic tone and decreased urine sodium. Choice C best describes the most likely set of findings for this patient.



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Correct Answer: C.

The patient is presenting with signs and symptoms of heart failure, such as exertional fatigue, shortness of breath, orthopnea, pulmonary crackles, and peripheral edema. Heart failure is a common complication of ischemic heart disease and hypertension. Renal blood flow is decreased, resulting in activation of the renin-angiotensin-aldosterone system because of decreased cardiac output that arises from heart failure. Renin converts angiotensinogen to angiotensin I, which is then converted to angiotensin II by angiotensin-converting enzyme in the pulmonary vasculature. Angiotensin II is a potent vasoconstrictor that directly mediates systemic hypertension (increased sympathetic tone). Angiotensin II also leads to increased Na^+ reabsorption in the renal tubules, and aldosterone release by the adrenal cortex with subsequent increased Na^+ resorption and fluid retention among other effects. The net result of decreased renal blood flow and activation of the renin-angiotensin-aldosterone system includes increased sympathetic tone and decreased urine sodium. Choice C best describes the most likely set of findings for this patient.

Incorrect Answers: A, B, D, and E.

Choices A and B describe decreased sympathetic tone. Reduced renal blood flow leads to increased sympathetic tone by activation of the renin-angiotensin-aldosterone system, making these choices incorrect.

Choices A, B, and D describe increased urine sodium concentration. The neurohormonal effect of angiotensin and aldosterone leads to decreased urine sodium concentration as the kidney attempts to reclaim solute and solvent when faced with low effective circulating volume. Therefore, these options are incorrect.

Choices B and E describe increased renal blood flow. Heart failure generally results in decreased renal blood flow due to decreased cardiac output, making these choices incorrect.

Educational Objective: Decreased renal blood flow causes activation of the renin-angiotensin-aldosterone system, with net effects of increased sympathetic tone, and sodium and fluid retention. Heart failure is a common cause of decreased effective circulating volume, sensed by the kidney as decreased blood flow.



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43. A 19-year-old man comes to the office because of a 10-hour history of shortness of breath and sharp, retrosternal chest pain radiating to his neck and left shoulder. The pain is worse with movement or swallowing. He also has a 1-week history of fever, malaise, myalgia, diarrhea, cough, and a scratchy sore throat. He has been unable to work as a summer lifeguard during this period. He smokes two packs of cigarettes daily. His temperature is 38°C (100.4°F), pulse is 70/min, respirations are 16/min, and blood pressure is 110/60 mm Hg. Examination and x-rays of the chest show normal findings. An ECG is shown. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) Arterial blood gas analysis
 - ☐ B) Coronary angiography
 - ☒ C) Echocardiography
 - ☐ D) Endomyocardial biopsy
 - ☐ E) Exercise stress test

Correct Answer: C.

Echocardiography is indicated in the setting of potential myopericarditis. Pericarditis classically presents with substernal chest pain, which is often pleuritic, worsens when lying down or with movement, and improves with leaning forward. It can occur in patients with inflammatory, infectious, or malignant conditions, such as viral infection, systemic lupus erythematosus, tuberculosis, and lymphoma, and can present as a complication of myocardial infarction or cardiac surgery. On examination, pericarditis shows a diastolic friction rub, described as a harsh sound heard in diastole. The condition is diagnosed clinically and supported by increased inflammatory markers such as ESR and C-reactive protein. Cardiac biomarkers such as troponin should be assessed to exclude myocarditis or cardiac ischemia. ECG may show diffuse ST-segment elevation and PR segment depression. If not treated, pericarditis can lead to the development of pericardial effusions, which if large and quickly accumulating, can result in cardiac tamponade. Echocardiography should be performed to assess for the presence of a pericardial effusion, which may require pericardiocentesis for drainage if large. Treatment includes anti-inflammatory medications such as indomethacin, glucocorticoids, and/or colchicine.

Incorrect Answers: A, B, D, and E.

Arterial blood gas analysis (Choice A) is used in the evaluation of shortness of breath, as calculating the A-a gradient permits refining the differential diagnosis. It would not further narrow the differential in this case.



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Correct Answer: C.

Echocardiography is indicated in the setting of potential myopericarditis. Pericarditis classically presents with substernal chest pain, which is often pleuritic, worsens when lying down or with movement, and improves with leaning forward. It can occur in patients with inflammatory, infectious, or malignant conditions, such as viral infection, systemic lupus erythematosus, tuberculosis, and lymphoma, and can present as a complication of myocardial infarction or cardiac surgery. On examination, pericarditis shows a diastolic friction rub, described as a harsh sound heard in diastole. The condition is diagnosed clinically and supported by increased inflammatory markers such as ESR and C-reactive protein. Cardiac biomarkers such as troponin should be assessed to exclude myocarditis or cardiac ischemia. ECG may show diffuse ST-segment elevation and PR segment depression. If not treated, pericarditis can lead to the development of pericardial effusions, which if large and quickly accumulating, can result in cardiac tamponade. Echocardiography should be performed to assess for the presence of a pericardial effusion, which may require pericardiocentesis for drainage if large. Treatment includes anti-inflammatory medications such as indomethacin, glucocorticoids, and/or colchicine.

Incorrect Answers: A, B, D, and E.

Arterial blood gas analysis (Choice A) is used in the evaluation of shortness of breath, as calculating the A-a gradient permits refining the differential diagnosis. It would not further narrow the differential in this case.

Coronary angiography (Choice B) is appropriate in suspected cases of coronary artery disease or ST-elevation myocardial infarction. This patient's ECG shows diffuse ST elevation; however, it also shows PR depression and occurs in the context of a febrile illness. Pericarditis is more likely in this case.

Endomyocardial biopsy (Choice D) is appropriate in suspected infiltrative cardiac diseases, such as amyloidosis or sarcoidosis. This test is invasive and inappropriate prior to further diagnostic steps in a case with a more likely diagnosis.

Exercise stress test (Choice E) is appropriate in the evaluation of exertional chest pain and shortness of breath. Patients with symptoms that are consistent with angina pectoris or with nonspecific symptoms exacerbated by exertion should undergo evaluation with a stress test. This patient's constant pain in the setting of fever and respiratory illness more likely represents pericarditis.

Educational Objective: Pericarditis is an inflammatory condition of the pericardium that causes positional chest pain that improves with leaning forward. ECG usually shows diffuse ST-segment elevations and/or PR-segment depressions. Patients should be evaluated with echocardiography to assess for associated effusion or cardiac dysfunction.



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- ✓ 44. A 62-year-old woman with metastatic adenocarcinoma of the breast is brought to the emergency department because of a 1-week history of weakness and a tingling sensation that has progressed from her lower legs to her chest. During the past 3 weeks, she has had mild to moderate interscapular pain, which is worse at night. Her only medication is tamoxifen. She does not appear to be in distress. Vital signs are within normal limits. Muscle strength is 4/5 in the lower extremities and 5/5 in the upper extremities. Deep tendon reflexes are 3+ in the lower extremities and 2+ in the upper extremities. Babinski sign is absent. Sensation to pinprick is decreased to the level of the mid chest. An MRI of the spine confirms the diagnosis. Administration of which of the following is the most appropriate next step in management?
- ☐ A) Anastrozole
 - ☒ B) Dexamethasone
 - ☐ C) Indomethacin
 - ☐ D) Morphine
 - ☐ E) Pamidronate

Correct Answer: B.

This patient's presenting signs and symptoms of focal back pain that is worse at nighttime, abnormal strength and reflex examination with upper motor neuron signs, sensory level, and history of metastatic disease is suggestive of epidural spinal cord compression caused by metastatic carcinoma. Metastatic disease frequently affects the vertebral column and may cause compression of the spinal cord by extending into the epidural space or by causing bony destruction and fracture of the vertebral bodies. Patients present with back pain, lower extremity weakness, loss of balance, urinary or bowel incontinence, or complete paralysis of the lower extremities. Early detection and treatment are crucial in order to prevent permanent spinal cord damage and myelopathy. Patients may benefit from short-term treatment with intravenous corticosteroids such as dexamethasone to decrease spinal cord edema, which is the most appropriate next step in this case. Definitive treatment often requires a combination of surgical decompression, chemotherapy, and/or radiotherapy.

Incorrect Answers: A, C, D, and E.

Anastrozole (Choice A), an aromatase inhibitor/antiestrogen medication, is used in the management of breast cancer which is hormone sensitive. Anastrozole suppresses



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☐ E) Pamidronate

Correct Answer: B.

This patient's presenting signs and symptoms of focal back pain that is worse at nighttime, abnormal strength and reflex examination with upper motor neuron signs, sensory level, and history of metastatic disease is suggestive of epidural spinal cord compression caused by metastatic carcinoma. Metastatic disease frequently affects the vertebral column and may cause compression of the spinal cord by extending into the epidural space or by causing bony destruction and fracture of the vertebral bodies. Patients present with back pain, lower extremity weakness, loss of balance, urinary or bowel incontinence, or complete paralysis of the lower extremities. Early detection and treatment are crucial in order to prevent permanent spinal cord damage and myelopathy. Patients may benefit from short-term treatment with intravenous corticosteroids such as dexamethasone to decrease spinal cord edema, which is the most appropriate next step in this case. Definitive treatment often requires a combination of surgical decompression, chemotherapy, and/or radiotherapy.

Incorrect Answers: A, C, D, and E.

Anastrozole (Choice A), an aromatase inhibitor/antiestrogen medication, is used in the management of breast cancer which is hormone sensitive. Anastrozole suppresses the growth of malignancies that are estrogen-receptor positive. If this patient's spinal metastasis is also hormone-receptor positive, anastrozole could also help slow its growth, however it has no role in the relief of immediate neurologic symptoms from cord compression, which must be reversed to prevent long-term morbidity.

Indomethacin (Choice C), an NSAID, is used in the management of pain and inflammation. It is a useful non-narcotic analgesic, however in this case, it would not address the concerning symptoms of spinal cord compression, it would only treat pain. Similarly, morphine (Choice D) is a narcotic analgesic. It is indicated in the management of acute, severe pain, however it offers no benefit in terms of reduction of cord compression. Corticosteroids are a more appropriate next step in management.

Pamidronate (Choice E) is a bisphosphonate/osteoclast inhibitor that is used in the management of hypercalcemia of malignancy, osteolysis, and bony metastatic disease, among other uses. It prevents resorption/destruction of bone by osteoclasts. While it has a use in the setting of bony metastatic disease, it offers no immediate relief of spinal cord compression from metastatic lesions.

Educational Objective: Patients with spinal cord compression present with back pain, weakness in or complete paralysis of the lower extremities, loss of balance, and urinary or bowel incontinence. Metastatic disease is a frequent cause of epidural spinal cord compression. Treatment with corticosteroids such as dexamethasone decreases associated edema and acts as an emergency bridge to radiotherapy or decompressive surgery.



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✓ 45. A case-control study is planned to determine the association between retinal detachment and occupations that require lifting heavy objects. A total of 200 patients of a large ophthalmologic clinic aged 40 to 80 years will be recruited for the study. Patients will be asked about their histories of lifting objects weighing more than 25 kg (55 lb). Which of the following is the best strategy in study design to decrease confounding by age for history of heavy lifting?

- ☐ A) Adjusting for age in multivariate analyses
- ☐ B) Excluding retirees from the control group
- ☒ C) Matching participants by age
- ☐ D) Recruiting only patients aged 60 years and older
- ☐ E) Stratifying results by age in tabular analyses

Correct Answer: C.

Matching participants by age is the best strategy to decrease the risk for confounding. Confounding is a common problem in research and should be accounted for in the study design. Confounding variables influence the independent and dependent variables and may lead to false assumptions or conclusions if the confounding variable is not evenly distributed across study groups. In this scenario, patients are asked about their experiences lifting heavy objects. An example of a potential confounder would be if one group of patients more often lifts heavier equipment and is younger, then the data will not be distributed evenly among the study groups. Matching participants by age will decrease the chance for confounding in this study.

Incorrect Answers: A, B, D, and E.

Adjusting for age in multivariate analyses (Choice A) is incorrect. In this study, patients with retinal detachment will be matched to those without retinal detachment of a similar age. This will help to minimize the effect of age as a confounding variable in the study.

Excluding retirees from the control group (Choice B) is incorrect. Excluding retirees from the control of patients could create a confounding variable in the study groups. In this case, matching participants based on age is the correct answer.

Recruiting only patients aged 60 years and older (Choice D) may limit the generalizability of the study. In this study, the objective is to investigate the association of retinal



☐ E) Stratifying results by age in tabular analyses

Correct Answer: C.

Matching participants by age is the best strategy to decrease the risk for confounding. Confounding is a common problem in research and should be accounted for in the study design. Confounding variables influence the independent and dependent variables and may lead to false assumptions or conclusions if the confounding variable is not evenly distributed across study groups. In this scenario, patients are asked about their experiences lifting heavy objects. An example of a potential confounder would be if one group of patients more often lifts heavier equipment and is younger, then the data will not be distributed evenly among the study groups. Matching participants by age will decrease the chance for confounding in this study.

Incorrect Answers: A, B, D, and E.

Adjusting for age in multivariate analyses (Choice A) is incorrect. In this study, patients with retinal detachment will be matched to those without retinal detachment of a similar age. This will help to minimize the effect of age as a confounding variable in the study.

Excluding retirees from the control group (Choice B) is incorrect. Excluding retirees from the control of patients could create a confounding variable in the study groups. In this case, matching participants based on age is the correct answer.

Recruiting only patients aged 60 years and older (Choice D) may limit the generalizability of the study. In this study, the objective is to investigate the association of retinal detachment and lifting heavy objects in both middle aged and older adults. Therefore, limiting the age range to only include older adults would limit the generalizability of the study.

Stratifying results by age in tabular analyses (Choice E) would break down the participants in the case and control group by age, however, matching participants by age will decrease the risk for confounding variables. In the given scenario, matching participants by age has a greater impact on decreasing confounding than stratifying the results based on age.

Educational Objective: Confounding is a common problem in biostatistical analysis, and investigators must take confounding into consideration when designing a study. Confounding variables influence both the independent and dependent variables and can lead to false associations if the confounding variable is not evenly distributed in both study groups. Matching is a statistical method employed to decrease confounding in research studies.



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46. A 21-year-old man comes to the office for a follow-up visit 1 week after urine dipstick analysis, performed for a sports physical examination, showed an increased protein concentration. He is asymptomatic. There is no personal or family history of serious illness. The patient does not smoke cigarettes, drink alcohol, or use illicit drugs. He trains for college basketball most of the year. He is 191 cm (6 ft 3 in) tall and weighs 84 kg (185 lb); BMI is 23 kg/m². His temperature is 36.7°C (98.0°F), pulse is 58/min, respirations are 10/min, and blood pressure is 126/76 mm Hg. Examination shows no abnormalities. Results of laboratory studies are within the reference ranges. Urinalysis shows 1+ protein. Spot urine protein:creatinine ratio was <0.2 at 8 AM and 0.7 at 4 PM. Which of the following is the most appropriate next step in diagnosis?

- ☐ A) Cystoscopy
- ☐ B) 24-Hour urine collection for measurement of total protein concentration and creatinine clearance
- ☐ C) Renal biopsy
- ☐ D) Renal ultrasonography
- ☒ E) No further studies are indicated

Correct Answer: E.

This healthy 21-year-old patient presents for evaluation of proteinuria shown on recent urinalysis. He has no risk factors for any specific renal pathology. His evaluation is notable for increased protein in his urine in the afternoon, but his morning assay is notable for minimal protein. This is most consistent with orthostatic proteinuria, a condition in which patients experience increased concentrations of urine protein when upright. Symptomatically, this can present with foamy urine at specific times of the day. Orthostatic proteinuria is believed to be a normal variant that carries a benign clinical course. There is no indication for further testing in the absence of any other clinical features. The condition should be differentiated from causes of proteinuria that are either treatable, or those that carry a nonbenign prognosis. These include, but are not limited to, nephritic/nephrotic syndromes and polycystic kidney disease.

Incorrect Answers: A, B, C, and D.



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Correct Answer: E.

This healthy 21-year-old patient presents for evaluation of proteinuria shown on recent urinalysis. He has no risk factors for any specific renal pathology. His evaluation is notable for increased protein in his urine in the afternoon, but his morning assay is notable for minimal protein. This is most consistent with orthostatic proteinuria, a condition in which patients experience increased concentrations of urine protein when upright. Symptomatically, this can present with foamy urine at specific times of the day. Orthostatic proteinuria is believed to be a normal variant that carries a benign clinical course. There is no indication for further testing in the absence of any other clinical features. The condition should be differentiated from causes of proteinuria that are either treatable, or those that carry a nonbenign prognosis. These include, but are not limited to, nephritic/nephrotic syndromes and polycystic kidney disease.

Incorrect Answers: A, B, C, and D.

Cystoscopy (Choice A) is appropriate to assess for conditions within the bladder that can be macroscopically visualized or biopsied. Examples include hematuria or suspected malignancy.

24-Hour urine collection for measurement of total protein concentration and creatinine clearance (Choice B) is appropriate in the evaluation of potential nephritic/nephrotic syndromes. This patient has proteinuria that is variable throughout the day, and no clinical evidence of any syndromic condition.

Renal biopsy (Choice C) is appropriate in the evaluation of conditions such as nephritic/nephrotic syndromes or malignancy. It is an invasive test that is not indicated in absence of suspicion for such conditions.

Renal ultrasonography (Choice D) is appropriate for evaluating renal masses, obstruction, blood flow, and/or congenital/anatomical abnormalities. This patient has no clinical evidence of malignant, obstructive, vascular, or structural renal disease.

Educational Objective: Orthostatic proteinuria presents with increased concentrations of urine protein when patients are upright. Symptomatically, they may report foamy urine at specific times of the day. It is believed to carry a benign clinical course. There is no indication for further testing in the absence of any other clinical features.

✓ 47. A 63-year-old man comes to the office because of chronic intermittent mild chest pain that usually occurs when he walks up two flights of stairs. He is otherwise asymptomatic. He has hypertension and coronary artery disease. He is adherent to his medication regimen of atorvastatin, clopidogrel, carvedilol, and aspirin. He has a sedentary lifestyle. He smoked two packs of cigarettes daily for 25 years but now smokes five cigarettes daily. He is 173 cm (5 ft 8 in) tall and weighs 91 kg (200 lb); BMI is 30 kg/m². Blood pressure is 130/65 mm Hg. Examination shows no other abnormalities. The patient asks about undergoing revascularization. The physician is aware of a randomized controlled trial in which aggressive lifestyle management is comparable to percutaneous coronary intervention (PCI) in terms of meaningful cardiovascular outcomes. Which of the following statistical features of the study is most supportive of a recommendation for lifestyle management in this patient?

	α Level	β Level (%)
<input checked="" type="radio"/> A)	0.20	5
<input type="radio"/> B)	0.20	10
<input type="radio"/> C)	0.25	10
<input type="radio"/> D)	0.25	20
<input type="radio"/> E)	0.5	50

Correct Answer: A.

An α level 0.20 and β level 5% would be the most supportive for recommending lifestyle management in this patient. The α level, or significance level of a study, relates to the probability of a type 1 error occurring. A type 1 error occurs when the null hypothesis is rejected when it should not be. The α level of 0.20 suggests a 20% possibility of a type 1 error, which represents the lowest probability of a type 1 error occurring. Power relates to the probability of a type 2 error, which is the risk for a study rejecting the null hypothesis and came to the wrong conclusion. The β level inversely relates to the power of the study, using the formula power = 1 – β, or 95 = 1 – 5%. This β level represents the lowest risk for a type 2 error occurring in the study.

Incorrect Answers: B, C, D, and E.

- ✓ 48. An 82-year-old man is admitted to the hospital 4 hours after he fell at home. His wife, who witnessed the fall, says his legs "gave out" when he stood up from his armchair. He was initially unresponsive but regained consciousness after 20 seconds. He did not have bowel or bladder incontinence during the episode. Medical history is remarkable for hypertension, type 2 diabetes mellitus, and benign prostatic hyperplasia. Medications are amlodipine, metformin, atorvastatin, and tamsulosin. On arrival at the hospital, pulse is 78/min, respirations are 18/min, and blood pressure is 98/72 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 97%. Cardiac examination discloses a late-peaking, barking systolic murmur heard at the upper right sternal border without an appreciable S₂. Carotid upstrokes are diminished, and peripheral pulses are symmetrically weak. The remainder of the physical examination discloses no abnormalities. Laboratory studies show a serum glucose concentration of 117 mg/dL. Which of the following is the most likely underlying cause of this patient's fall?

- ☒ A) Aortic stenosis
- ☐ B) Autonomic dysreflexia
- ☐ C) Hyperglycemia
- ☐ D) Orthostatic hypotension
- ☐ E) Vertebrobasilar insufficiency

Correct Answer: A.

This patient's episode of orthostatic syncope in the setting of a harsh, systolic murmur and a decreased S₂ heart sound suggest that aortic stenosis is the cause of the patient's symptoms. Many people will develop some degree of valve stenosis in their lifetime as a result of chronic inflammation with resultant calcification and fibrosis, with the aortic valve commonly affected. Patients may report fatigue, shortness of breath, cough, diminished exercise tolerance, chest pain, or syncope with exertion. Examination findings include a crescendo-decrescendo systolic murmur best heard at the upper right sternal border, and pulsus parvus et tardus (weak and delayed pulse) may be noted on examination of peripheral pulses. A diminished carotid upstroke may be present. A decreased or absent S₂ heart sound results from weakened closing of the valve. Severe aortic stenosis can lead to left ventricular hypertrophy and heart failure over time. Treatment includes medical optimization and valve replacement.

Incorrect Answers: B, C, D, and E.

patient's symptoms. Many people will develop some degree of valve stenosis in their lifetime as a result of chronic inflammation with resultant calcification and fibrosis, with the aortic valve commonly affected. Patients may report fatigue, shortness of breath, cough, diminished exercise tolerance, chest pain, or syncope with exertion. Examination findings include a crescendo-decrescendo systolic murmur best heard at the upper right sternal border, and pulsus parvus et tardus (weak and delayed pulse) may be noted on examination of peripheral pulses. A diminished carotid upstroke may be present. A decreased or absent S₂ heart sound results from weakened closing of the valve. Severe aortic stenosis can lead to left ventricular hypertrophy and heart failure over time. Treatment includes medical optimization and valve replacement.

Incorrect Answers: B, C, D, and E.

Autonomic dysreflexia (Choice B) describes sympathetic hyperactivity or inappropriate autonomic nervous system responses to painful/noxious stimuli, generally in patients with spinal cord or neurologic injuries. In contrast, autonomic instability (dysautonomia) describes orthostatic hypotension, inappropriate bradycardia, inotropic incompetence, or loss of vasomotor tone occurring with multiple underlying, often neurologic, conditions including but not limited to Parkinson disease, Ehlers-Danlos syndrome, and multisystem atrophy. Neither condition would present with the cardiovascular findings seen in this patient.

Hyperglycemia (Choice C) can result in orthostatic syncope from osmotic dehydration. This patient's blood glucose concentration is only minimally increased.

Orthostatic hypotension (Choice D) is diagnosed by a decrease in systolic blood pressure of 20 mm Hg, or diastolic blood pressure of 10 mm Hg when rising to standing position from seated or supine. There are many causes, including dehydration, adverse effects of medications (especially antihypertensives and beta-blockers), and autonomic instability. This patient has likely experienced an episode of orthostatic hypotension leading to syncope; however, this arises due to impaired cardiac output from valvulopathy in his case. His cardiac examination is fitting of aortic stenosis as an underlying cause of syncope and postural hypotension, whereas the causes of orthostatic hypotension are broader.

Vertebrobasilar insufficiency (Choice E) describes ischemia of the posterior cerebral circulation and typically presents with vertigo, light-headedness, disequilibrium, ataxia, and nystagmus (due to decreased blood supply to the vestibular nuclei). It is most commonly due to atherosclerosis. The onset is typically sudden and episodic following changes in the position of the neck.

Educational Objective: Aortic stenosis typically presents with a crescendo-decrescendo systolic murmur, best heard at the upper right sternal border. It classically occurs secondary to age-related fibrotic and calcific changes of the valve but can occur earlier in life in cases of bicuspid aortic valve or chronic rheumatic heart disease. Presenting symptoms include syncope, angina, and dyspnea on exertion.



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- ✓ 49. A 7-year-old girl is brought to the clinic by her mother for a well-child examination. The mother is single, and the patient is the third of five children. The family comes late to the appointment because they missed the first bus on the route to the clinic. The patient's medical record shows that she missed her last two appointments and was last seen for a physical examination 2 years ago. The mother reports her daughter has frequent illnesses. She receives no medications. The patient is clean and appropriately dressed but appears tired and sluggish. She is at the 50th percentile for height, 10th percentile for weight, and below the 5th percentile for BMI. Two years ago, she was at the 50th percentile for height, 25th percentile for weight, and 15th percentile for BMI. Vital signs are within normal limits. Examination shows dry, flaky skin and brittle hair. No other abnormalities are noted. Which of the following is the most appropriate next step in management?
- ☒ A) Ask the mother whether she is worried about feeding her family
 - ☐ B) Call child protective services
 - ☐ C) Counsel the patient's mother regarding healthy nutrition
 - ☐ D) Order a complete blood count and metabolic panel
 - ☐ E) Recommend that the patient drink a daily protein supplement

Correct Answer: A.

Ask the mother whether she is worried about feeding her family is the correct answer. In this vignette, the family's difficulty securing transportation for medical appointments, patient's decline on the growth curve, and objective findings including dry skin and brittle hair suggest there are multiple social inequities hindering this patient's normal growth and development. In order to build trust with the patient's mother, asking open-ended questions about access to basic resources and providing the mother with additional resources and support are the next steps in management. Additionally, asking open-ended questions may provide the mother an opportunity to discuss additional concerns. In this case, if there are concerns related to food insecurity, the mother should be provided additional resources, such as consultation with a social worker. Overall, inquiring about and addressing social determinants of health at an early age is important to providing holistic care for the patient.

Incorrect Answers: B, C, D, and E.

Call child protective services (Choice B) is incorrect. In cases of suspected child abuse or if the patient was in immediate danger, calling child protective services would be



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Ask the mother whether she is worried about feeding her family is the correct answer. In this vignette, the family's difficulty securing transportation for medical appointments, patient's decline on the growth curve, and objective findings including dry skin and brittle hair suggest there are multiple social inequities hindering this patient's normal growth and development. In order to build trust with the patient's mother, asking open-ended questions about access to basic resources and providing the mother with additional resources and support are the next steps in management. Additionally, asking open-ended questions may provide the mother an opportunity to discuss additional concerns. In this case, if there are concerns related to food insecurity, the mother should be provided additional resources, such as consultation with a social worker. Overall, inquiring about and addressing social determinants of health at an early age is important to providing holistic care for the patient.

Incorrect Answers: B, C, D, and E.

Call child protective services (Choice B) is incorrect. In cases of suspected child abuse or if the patient was in immediate danger, calling child protective services would be recommended. However, in this vignette there is concern related to the patient's mother being able to provide adequate nutrition to her family. If the mother does have concerns related to providing her children adequate meals, the next step in management would be to provide her additional resources and support, such as consultation with a social worker.

Counsel the patient's mother regarding healthy nutrition (Choice C) is incorrect. In this case, the patient is receiving inadequate nutrition, which may be related to social or financial constraints as opposed to health care literacy. Based on the clinical scenario, the next step would be to ask the patient's mother open-ended questions and provide her access to additional resources.

Order a complete blood count and metabolic panel (Choice D) is incorrect. Laboratory studies in patients with malnutrition may show findings that include electrolyte abnormalities, hypoglycemia, or anemia; however, the next step in management is to first ask and assess the patient's mother's ability to provide her family adequate nutrition.

Recommend that the patient drink a daily protein supplement (Choice E) is incorrect. This patient is presenting with symptoms suggestive of inadequate caloric intake, as opposed to isolated protein deficiency. In this case, the next step in management is to ask the patient's mother open-ended questions and provide the mother with additional support.

Educational Objective: Social determinants of health, including access to adequate nutrition, play a critical role in the overall health of young patients. Families of children who show a decline on the growth curve, show physical findings suggestive of inadequate caloric intake or vitamin insufficiency, or additional concerning factors should be screened to see if additional support is required. In cases where there is concern, additional support of a social worker may be beneficial.



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✓ 50. A 44-year-old woman comes to the clinic because of a 6-month history of persistent skin lesions over her scalp and neck despite topical clobetasol therapy. She has hypertension and discoid lupus erythematosus. Her only other medication is hydrochlorothiazide. Temperature is 37.2°C (99.0°F), pulse is 82/min, respirations are 14/min, and blood pressure is 126/74 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 99%. Physical examination shows several erythematous indurated plaques with overlying scales over the scalp and lateral aspects of the neck. Oropharynx is moist and pink without lesions. There is no joint swelling, tenderness, or erythema. Cardiopulmonary, abdominal, and neurologic examinations disclose no abnormalities. The physician prescribes hydroxychloroquine once daily to be increased to twice daily during the next 2 weeks. Which of the following screening studies is most appropriate at this time?

- ☐ A) ECG
- ☒ B) Ophthalmologic examination
- ☐ C) Pulmonary function testing
- ☐ D) Serum lipid studies
- ☐ E) Serum thyroid-stimulating hormone concentration

Correct Answer: B.

Hydroxychloroquine is an antimalarial medication that can also serve as an antirheumatic medication, modulating immune system function. It is useful in diseases such as rheumatoid arthritis and discoid lupus erythematosus, as seen in this patient. Hydroxychloroquine use has been associated with retinal toxicity and permanent vision loss in approximately 7.5% of patients. Pre-existing maculopathy is a strong risk factor for hydroxychloroquine-induced retinal toxicity and a contraindication to hydroxychloroquine use. Ophthalmologic examination is needed for patients beginning hydroxychloroquine treatment to rule out pre-existing maculopathy and to establish a baseline prior to long-term use, and routine ophthalmologic examination is recommended to monitor for this potential adverse effect. Other common adverse effects include nausea, diarrhea, rash, hair changes, and weakness. Occasionally, patients may experience neuropsychiatric side effects.

Incorrect Answers: A, C, D, and E.

ECG (Choice A) is indicated in critically ill patients or patients with risk factors for QTc prolongation, as hydroxychloroquine is associated with QTc prolongation. However, routine ECG screening in patients without these risk factors is not necessary.

- ☐ A) ECG
- ☒ B) Ophthalmologic examination
- ☐ C) Pulmonary function testing
- ☐ D) Serum lipid studies
- ☐ E) Serum thyroid-stimulating hormone concentration

Correct Answer: B.

Hydroxychloroquine is an antimalarial medication that can also serve as an antirheumatic medication, modulating immune system function. It is useful in diseases such as rheumatoid arthritis and discoid lupus erythematosus, as seen in this patient. Hydroxychloroquine use has been associated with retinal toxicity and permanent vision loss in approximately 7.5% of patients. Pre-existing maculopathy is a strong risk factor for hydroxychloroquine-induced retinal toxicity and a contraindication to hydroxychloroquine use. Ophthalmologic examination is needed for patients beginning hydroxychloroquine treatment to rule out pre-existing maculopathy and to establish a baseline prior to long-term use, and routine ophthalmologic examination is recommended to monitor for this potential adverse effect. Other common adverse effects include nausea, diarrhea, rash, hair changes, and weakness. Occasionally, patients may experience neuropsychiatric side effects.

Incorrect Answers: A, C, D, and E.

ECG (Choice A) is indicated in critically ill patients or patients with risk factors for QTc prolongation, as hydroxychloroquine is associated with QTc prolongation. However, routine ECG screening in patients without these risk factors is not necessary.

Pulmonary function testing (Choice C), serum lipid studies (Choice D), and serum thyroid-stimulating hormone concentration (Choice E) are not necessary for patients taking hydroxychloroquine. Respiratory and thyroid complications are rare. Hydroxychloroquine has sometimes led to improvement in lipid profile.

Educational Objective: Hydroxychloroquine use has been associated with retinal toxicity and permanent vision loss. Baseline ophthalmologic examination should be completed at initiation of treatment and routine testing is recommended to monitor for adverse effects.

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- ✓ 1. A 42-year-old woman has had progressive shortness of breath with exertion over the past 2 months. Cardiac examination shows a prominent cardiac impulse along the left sternal border and a fixed split S₂. A grade 1/6, low-pitched diastolic murmur is heard along the left sternal border. Which of the following is the most likely cause of these findings?
- ☐ A) Aortic insufficiency
 - ☐ B) Aortic stenosis
 - ☒ C) Atrial septal defect
 - ☐ D) Coarctation of the aorta
 - ☐ E) Mitral insufficiency
 - ☐ F) Mitral stenosis
 - ☐ G) Pulmonic stenosis

Correct Answer: C.

Atrial septal defect is a common congenital malformation of the interatrial septum; the most common type is an ostium secundum defect. The atrial septal defect results in a left-to-right shunt with abnormal flow of blood from the left atrium to the right atrium, resulting in relative volume overload of the right atrium and ventricle. This increased stroke volume of the right ventricle results in delayed closure of the pulmonic valve, which presents as a fixed, split S₂, and low-grade physiologic ejection murmur on cardiac auscultation. The increased right heart volumes also result in a prominent right ventricular impulse on physical examination. If the atrial septal defect remains uncorrected, it can result in the development of Eisenmenger syndrome secondary to prolonged pulmonary vasculature remodeling resulting in pulmonary arterial hypertension and shunt reversal leading to cyanosis. Asymptomatic atrial septal defects may become clinically significant in the setting of increased blood flow.

Incorrect Answers: A, B, D, E, F, and G.

Aortic insufficiency (Choice A) presents with an early diastolic decrescendo murmur best heard in the right second intercostal space, and is most associated with endocarditis, acute rheumatic fever, and aortic root dilation.



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left-to-right shunt with abnormal flow of blood from the left atrium to the right atrium, resulting in relative volume overload of the right atrium and ventricle. This increased stroke volume of the right ventricle results in delayed closure of the pulmonic valve, which presents as a fixed, split S_2 , and low-grade physiologic ejection murmur on cardiac auscultation. The increased right heart volumes also result in a prominent right ventricular impulse on physical examination. If the atrial septal defect remains uncorrected, it can result in the development of Eisenmenger syndrome secondary to prolonged pulmonary vasculature remodeling resulting in pulmonary arterial hypertension and shunt reversal leading to cyanosis. Asymptomatic atrial septal defects may become clinically significant in the setting of increased blood flow.

Incorrect Answers: A, B, D, E, F, and G.

Aortic insufficiency (Choice A) presents with an early diastolic decrescendo murmur best heard in the right second intercostal space, and is most associated with endocarditis, acute rheumatic fever, and aortic root dilation.

Aortic stenosis (Choice B) presents with a systolic crescendo-decrescendo murmur heard best at the right upper sternal border, with radiation to the carotid arteries. Symptoms depend on the severity of aortic stenosis and are graded by echocardiography.

Coarctation of the aorta (Choice D) refers to a narrowing of the aorta. It is associated with a bicuspid aortic valve and Turner syndrome. It typically presents with a systolic murmur along with differential pulses and blood pressures between extremities.

Mitral insufficiency (Choice E) presents with a holosystolic murmur best heard in the left fourth or fifth intercostal space along the midclavicular line and radiates to the left axilla. It is commonly associated with mitral valve prolapse, acute rheumatic fever, endocarditis, and prior myocardial infarction.

Mitral stenosis (Choice F) is classically heard as an opening snap followed by a diastolic rumble, which is loudest over the cardiac apex, and radiates to the axilla. If severe enough, it can result in left atrial enlargement, cardiogenic pulmonary edema, and arrhythmias such as atrial fibrillation and flutter.

Pulmonic stenosis (Choice G) presents with a systolic murmur best heard in the second left intercostal region, which is also often crescendo-decrescendo, though quieter than aortic stenosis and with less radiation to the lower neck due to the lower pressure in the pulmonary circulation. This is typically seen in the setting of tetralogy of Fallot.

Educational Objective: A fixed, widely split S_2 is characteristic of an atrial septal defect as a result of increased blood flow through the pulmonic valve. Severe defects can result in pulmonary hypertension and development of Eisenmenger syndrome over time, with reversal of the left-to-right shunt.



✓ 2. Fifteen minutes ago, a 19-year-old man sustained a gunshot wound to the right temporal region with an exit wound at the left temporal region. He was intubated at the scene and received supplemental oxygen and intravenous fluids. On arrival, his pulse is 60/min, and blood pressure is 170/100 mm Hg. His pupils are fixed and dilated, and he does not respond to stimuli. Which of the following is the most appropriate next step to determine brain death?

- ☐ A) Measurement of intracranial pressure
- ☒ B) Assessment of brain stem reflexes
- ☐ C) CT scan of the head
- ☐ D) EEG
- ☐ E) Cerebral angiography

Correct Answer: B.

According to the American Academy of Neurology, brain death is defined as the permanent loss of all brain stem functions. Brain death commonly occurs after an acute catastrophic brain injury secondary to intracranial trauma, intracranial hemorrhage, or cardiovascular collapse. Brain death can be diagnosed by a neurologic examination (showing absent cranial nerve reflexes and a lack of response to central pain) and an apnea test (showing an absence of respiratory drive). For this patient, the most appropriate next step to determine brain death is assessment of brain stem reflexes. Ancillary tests such as EEG and angiography can be used when the diagnosis is uncertain. A patient with brain death is clinically and legally dead. As such, mechanical ventilation, if used, may be withdrawn without family permission. Hospital policies may vary to some extent on the exact timing of a brain death examination, and physicians should be familiar with the standard of care in their individual settings.

Incorrect Answers: A, C, D, and E.

Measurement of intracranial pressure (Choice A) via lumbar puncture may assess for mass occupying lesions or bleeds. These central nervous system conditions can lead to brain death, but not all causes of brain death would lead to increased intracranial pressure. Assessing brain stem reflexes is therefore more reliable.

CT scan of the head (Choice C) would assist in determining structural causes of brain death. However, not all cases of brain death involve structural brain abnormalities (eg, some involve metabolic causes). These studies do not assess brain function.



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- ☐ D) EEG
- ☐ E) Cerebral angiography

Correct Answer: B.

According to the American Academy of Neurology, brain death is defined as the permanent loss of all brain stem functions. Brain death commonly occurs after an acute catastrophic brain injury secondary to intracranial trauma, intracranial hemorrhage, or cardiovascular collapse. Brain death can be diagnosed by a neurologic examination (showing absent cranial nerve reflexes and a lack of response to central pain) and an apnea test (showing an absence of respiratory drive). For this patient, the most appropriate next step to determine brain death is assessment of brain stem reflexes. Ancillary tests such as EEG and angiography can be used when the diagnosis is uncertain. A patient with brain death is clinically and legally dead. As such, mechanical ventilation, if used, may be withdrawn without family permission. Hospital policies may vary to some extent on the exact timing of a brain death examination, and physicians should be familiar with the standard of care in their individual settings.

Incorrect Answers: A, C, D, and E.

Measurement of intracranial pressure (Choice A) via lumbar puncture may assess for mass occupying lesions or bleeds. These central nervous system conditions can lead to brain death, but not all causes of brain death would lead to increased intracranial pressure. Assessing brain stem reflexes is therefore more reliable.

CT scan of the head (Choice C) would assist in determining structural causes of brain death. However, not all cases of brain death involve structural brain abnormalities (eg, some involve metabolic causes). These studies do not assess brain function.

EEG (Choice D) is an ancillary test that can be used when the brain death diagnosis is uncertain. EEG shows electrical inactivity in brain death. Some countries use EEG in brain death diagnostic criteria, but the United States does not.

Cerebral angiography (Choice E) assists in identifying structural abnormalities of the cerebral vasculature. It does not assess brain function and is therefore less useful in evaluating brain death.

Educational Objective: Brain death, or the permanent loss of all brain stem functions, is diagnosed by assessment of brain stem reflexes by neurologic examination and apnea test. Brain death constitutes legal and clinical death, and mechanical ventilation, if used, may be withdrawn without family permission.



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- ✓ 3. A randomized, double-blind, controlled trial is conducted to assess the effectiveness of a new drug to treat duodenal ulcer disease. The study requires that patients are symptomatic and have evidence of duodenal ulcer disease on upper endoscopy. After informed consent is obtained, patients are randomly assigned to receive the new drug or a placebo via a random numbers table. Upper endoscopy will be performed on each patient at the end of the study. The end points are patient-reported symptoms and results of the upper endoscopy. Which of the following raises the most concern about this trial?
- ☐ A) Double-blind design
 - ☐ B) Entrance criteria
 - ☐ C) Patient randomization techniques
 - ☐ D) Selected end points
 - ☒ E) Use of an inappropriate control

Correct Answer: E.

Use of an inappropriate control is the most concerning portion of this study. Standard of care treatments exist for the treatment of stomach and duodenal ulcers. In randomized control trials, a new treatment should be compared to the current standard of care as opposed to a placebo. Furthermore, using a placebo as opposed to a standard of care treatment is considered medically unethical. Despite this, strengths of this trial include randomization, a double-blind approach, and use of an endoscopy to help determine the presence of duodenal ulcer disease and the clinical outcomes following treatment.

Incorrect Answers: A, B, C, and D.

Double-blind design (Choice A) is a strength of the proposed trial. A double-blind design prevents examiners and patients from knowing if they received placebo or the experimental drug. In this experiment, the standard of care should be used as the control group as opposed to a placebo.

Entrance criteria (Choice B) are characteristics required for participation in a study. For this study, the presence of symptoms and evidence of duodenal ulcer on endoscopy are criteria shared by all participants. This consistency in the study population is a strength of the study. In this case, an inappropriate control was used for the study.



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Correct Answer: E.

Use of an inappropriate control is the most concerning portion of this study. Standard of care treatments exist for the treatment of stomach and duodenal ulcers. In randomized control trials, a new treatment should be compared to the current standard of care as opposed to a placebo. Furthermore, using a placebo as opposed to a standard of care treatment is considered medically unethical. Despite this, strengths of this trial include randomization, a double-blind approach, and use of an endoscopy to help determine the presence of duodenal ulcer disease and the clinical outcomes following treatment.

Incorrect Answers: A, B, C, and D.

Double-blind design (Choice A) is a strength of the proposed trial. A double-blind design prevents examiners and patients from knowing if they received placebo or the experimental drug. In this experiment, the standard of care should be used as the control group as opposed to a placebo.

Entrance criteria (Choice B) are characteristics required for participation in a study. For this study, the presence of symptoms and evidence of duodenal ulcer on endoscopy are criteria shared by all participants. This consistency in the study population is a strength of the study. In this case, an inappropriate control was used for the study.

Patient randomization techniques (Choice C) help to ensure a similar distribution of patients across study groups. One randomization technique is the use of a random numbers table to assign patients to study groups. The use of a randomization technique to distribute patients across study groups represents a strength of the study.

Selected end points (Choice D) in the trial include patient-reported symptoms and results of the upper endoscopy at the end of the study. These are well-demarcated endpoints and appropriate for the trial design, which overall represent a strength of the study.

Educational Objective: Double-blind, randomized control trials are the gold standard for investigating clinical outcomes of various treatments and procedures. In randomized control trials, new treatments are compared against the accepted standard of care for a clinical condition to determine efficacy of the treatment. The use of a placebo represents an inappropriate and medically unethical control group when standard of care treatments exist.



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- ✓ 4. A 27-year-old woman, gravida 2, para 1, at 34 weeks' gestation comes to the physician because she is concerned about her baby's growth. Her friends comment regularly about the small size of her abdomen. Her first child was delivered at 39 weeks' gestation and weighed 3000 g (6 lb 10 oz); he now is at the age of 16 months and has had normal growth and development. Her last menstrual period and ultrasound measurements are compatible with a current estimated gestational age of 34 weeks. Her husband is 168 cm (5 ft 6 in) tall. She is 140 cm (4 ft 7 in) tall and currently weighs 46 kg (102 lb). Abdominal examination shows a uterus consistent in size with a 32-week gestation and a well-engaged vertex. Ultrasonography shows a fetus consistent in size with a 32-week gestation. Which of the following is the most appropriate next step in management?

- ☒ A) Reassurance
- ☐ B) Weekly nonstress test
- ☐ C) Fetal fibronectin test
- ☐ D) Amniocentesis for fetal lung maturity
- ☐ E) Immediate delivery

Correct Answer: A.

This patient is presenting at 34 weeks' gestation with physical examination and sonographic fetal measurements consistent with a 32-week gestation. During the first trimester of pregnancy, the margin of error for crown-rump length measurements is approximately 1 week. As the gestation progresses, the margin of error and variation in normal fetal measurement widens, with measurements in the third trimester demonstrating margins of error of about 3 weeks. Given that this patient's fetus is measuring within 2 weeks of her gestation, this is considered normal. This patient should be reassured at this time, as there is nothing concerning otherwise, clinically or on imaging. As well, this patient is of short stature, which may account for the smaller size of her fetus. Further testing is unnecessary and may only serve to increase this patient's anxiety about her pregnancy.

Incorrect Answers: B, C, D, and E.

Weekly nonstress test (Choice B) is not necessary for this patient with a fetus measuring within the margin of error and normal limits for size. This frequency of testing is indicated in some patients with a history of fetal demise/late term stillbirth, fetal congenital abnormalities, small for gestational age fetus, and a variety of other conditions.



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Correct Answer: A.

This patient is presenting at 34 weeks' gestation with physical examination and sonographic fetal measurements consistent with a 32-week gestation. During the first trimester of pregnancy, the margin of error for crown-rump length measurements is approximately 1 week. As the gestation progresses, the margin of error and variation in normal fetal measurement widens, with measurements in the third trimester demonstrating margins of error of about 3 weeks. Given that this patient's fetus is measuring within 2 weeks of her gestation, this is considered normal. This patient should be reassured at this time, as there is nothing concerning otherwise, clinically or on imaging. As well, this patient is of short stature, which may account for the smaller size of her fetus. Further testing is unnecessary and may only serve to increase this patient's anxiety about her pregnancy.

Incorrect Answers: B, C, D, and E.

Weekly nonstress test (Choice B) is not necessary for this patient with a fetus measuring within the margin of error and normal limits for size. This frequency of testing is indicated in some patients with a history of fetal demise/late term stillbirth, fetal congenital abnormalities, small for gestational age fetus, and a variety of other conditions. This patient does not meet criteria for this test.

Fetal fibronectin test (Choice C) is a test performed for the assessment of prelabor rupture of membranes in a pregnant patient. Vaginal fluid is sampled for this examination, and if increased, assists the clinician in understanding the patient's risk for premature birth. Fetal fibronectin is an extracellular matrix glycoprotein localized at the maternal-fetal interface of the amniotic membranes.

Amniocentesis for fetal lung maturity (Choice D) can be used after 32 weeks' gestation to understand the appropriate treatment course. Prior to 32 weeks' gestation, fetal lung maturity is unlikely and empiric treatment should be administered. Amniotic fluid is sampled during this procedure to measure the lecithin-to-sphingomyelin concentration. This helps guide management of the fetal lung maturity in balance with the timing of fetal delivery.

Immediate delivery (Choice E) is not necessary for this patient. This patient's pregnancy is measuring within limits of normal for the gestational age. While immediate delivery is necessary in some instances, especially those suggestive of fetal or maternal morbidity/mortality, this patient does not meet criteria for immediate delivery.

Educational Objective: When measuring a fetus both on physical examination and during ultrasonography, there is an appropriate margin of error of these measurements and tolerance for variation from the average normal size for a fetus. This patient's fetus falls within these normal limits, and no further steps need to be taken other than reassurance.



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- ✓ 5. A previously healthy 37-year-old woman is brought to the emergency department 2 hours after the sudden onset of severe pain and light intolerance of the right eye. She has no history of trauma, foreign bodies, or irritating substances in the right eye. She takes no medications and has no known allergies. Her temperature is 37°C (98.6°F). Examination shows mild injection of the right conjunctiva and mild clouding of the anterior chamber. Direct light into the right eye produces severe pain. The pupils are asymmetric. Visual acuity and intraocular pressures are normal bilaterally. Which of the following is the most likely diagnosis?
- ☐ A) Corneal abrasion
 - ☐ B) Endophthalmitis
 - ☐ C) Glaucoma
 - ☒ D) Iritis
 - ☐ E) Optic neuritis

Correct Answer: D.

Iritis, also known as anterior uveitis, is a common inflammatory disorder characterized by inflammation of the iris and ciliary body. While most commonly idiopathic, iritis may occur in the setting of HLA-B27 seronegative spondyloarthropathies, secondary to certain medications (eg, cidofovir, rifabutin, bisphosphonates), in the setting of infections (eg, herpetic infection, syphilis, tuberculosis), or trauma. Patients typically present with symptoms of eye pain, redness, and photophobia. Visual acuity may be reduced but is often well-preserved. An examination with a slit lamp is essential to identify any corneal trauma, to assess the degree of inflammation within the anterior chamber, and to exclude the presence of vitreous or retinal inflammation. The anterior chamber shows inflammatory cells suspended in the aqueous humor, and flare, which describes a visible hazy or turbid appearance of the beam as it passes through the aqueous humor. The diagnosis is clinical, but additional laboratory studies may be warranted in some cases. The mainstay of treatment is with topical corticosteroids. Patients may experience recurrence, but the visual prognosis is favorable with appropriate diagnosis and treatment.

Incorrect Answers: A, B, C, and E.

Corneal abrasion (Choice A) describes a disruption of the corneal epithelium and presents with sharp eye pain, foreign body sensation, conjunctival injection, and tearing. Instillation of fluorescein dye will cause the area of the abrasion to appear green when viewed under cobalt blue light. Common causes include trauma, contact lens wear.



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chamber, and to exclude the presence of vitreous or retinal inflammation. The anterior chamber shows inflammatory cells suspended in the aqueous humor, and flare, which describes a visible hazy or turbid appearance of the beam as it passes through the aqueous humor. The diagnosis is clinical, but additional laboratory studies may be warranted in some cases. The mainstay of treatment is with topical corticosteroids. Patients may experience recurrence, but the visual prognosis is favorable with appropriate diagnosis and treatment.

Incorrect Answers: A, B, C, and E.

Corneal abrasion (Choice A) describes a disruption of the corneal epithelium and presents with sharp eye pain, foreign body sensation, conjunctival injection, and tearing. Instillation of fluorescein dye will cause the area of the abrasion to appear green when viewed under cobalt blue light. Common causes include trauma, contact lens wear, and spontaneous erosion. Photophobia and anterior chamber flare are less common in the setting of corneal abrasion and suggest a diagnosis of iritis.

Endophthalmitis (Choice B) describes purulent inflammation of the aqueous or vitreous humors in the setting of intraocular infection. Endophthalmitis can be caused by bacterial or fungal organisms and can be acquired exogenously (eg, in the setting of ocular surgery or trauma) or endogenously (via hematogenous dissemination). The clinical course and visual prognosis are variable and depend on the causative organism, time to diagnosis and treatment, degree of inflammation, and ocular co-morbidities. Patients typically present with acute vision loss (typically painful), anterior chamber inflammation and layered debris (hypopyon), vitritis, and retinal hemorrhage.

Glaucoma (Choice C) is an optic neuropathy characterized by optic nerve cupping and visual field defects due to loss of retinal ganglion cells, typically in the setting of increased intraocular pressure. Acute angle closure glaucoma is characterized by acute vision loss and eye pain. The eye is usually notable for conjunctival injection, corneal edema, a shallow anterior chamber with a closed canal of Schlemm, and a fixed and mid-dilated pupil. This patient has a normal intraocular pressure, rendering the diagnosis of glaucoma less likely.

Optic neuritis (Choice E) is an autoimmune, inflammatory disorder of the optic nerve that presents with acute onset vision loss and ocular pain that is exacerbated with extraocular movements. Patients typically present with decreased visual acuity and color vision, along with a relative afferent pupillary defect. Diagnosis is confirmed with MRI. There is a strong association with multiple sclerosis, of which optic neuritis is a common initial finding.

Educational Objective: Iritis is a common inflammatory disorder characterized by inflammation of the iris and ciliary body. It is commonly idiopathic, but a careful history is essential for identifying associated risk factors such as autoimmune disease, infection, medications, or trauma. Patients typically present with eye pain, redness, and photophobia. The diagnosis is clinical, and the characteristic findings are anterior chamber-suspended inflammatory cells and flare.



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✓ 6. A previously healthy 4-year-old girl is brought to the physician because of a 1-week history of abdominal pain and diarrhea. Her stools have been streaked with blood. She has not had fever. She has received all recommended immunizations except for hepatitis B vaccine (HBV). She is pale and irritable. Her temperature is 37.5°C (99.5°F), pulse is 160/min, respirations are 26/min, and blood pressure is 128/84 mm Hg. Examination shows generalized moderate edema. Laboratory studies show:

Hematocrit	24%
Reticulocyte count	10%
Platelet count	40,000/mm ³
Serum	
Urea nitrogen	90 mg/dL
Creatinine	7.8 mg/dL

Which of the following is most likely to have prevented this patient's condition?

- ☐ A) Administration of antibiotics
- ☐ B) Administration of gastrointestinal ant motility drugs
- ☐ C) Administration of HBV
- ☐ D) Administration of immune globulin
- ☒ E) Appropriate food preparation

Correct Answer: E.

Hemolytic uremic syndrome (HUS) most likely explains this patient's acute kidney injury, thrombocytopenia, and anemia. HUS is typically seen in children and is often

Correct Answer: E.

Hemolytic uremic syndrome (HUS) most likely explains this patient's acute kidney injury, thrombocytopenia, and anemia. HUS is typically seen in children and is often caused by infection with Shiga toxin-producing *Escherichia coli* O157:H7. It is usually accompanied by bloody diarrhea. Infection with *E. coli* may occur from contaminated water, fruits, vegetables, or undercooked meat. Widespread microvascular thrombosis consumes platelets and predisposes circulating erythrocytes to shearing forces as a result of a disrupted vascular lumen. When erythrocytes come into contact with microvascular clots, they are damaged, resulting in schistocytes, which are apparent on peripheral blood smear as fragmented cells. Thrombosis also occurs in the renal vasculature as a result of underlying endothelial damage, resulting in kidney injury. Differentiating HUS from disseminated intravascular coagulation (DIC) is important and can be done by examining the prothrombin and activated partial thromboplastin time; these are normal in HUS and increased in DIC as a result of clotting factor consumption. Treatment of HUS is supportive, although eculizumab, a human monoclonal IgG antibody against complement protein C5 that prevents formation of the membrane attack complex, has been used in refractory cases. Appropriate food preparation is most likely to have prevented this patient's condition.

Incorrect Answers: A, B, C, and D.

Administration of antibiotics (Choice A) is avoided in cases of HUS as it can result in an increased release of Shiga toxin and worsen clinical deterioration. Appropriate food preparation is most likely to have prevented this patient's condition.

Administration of gastrointestinal ant motility drugs (Choice B) may be a reasonable treatment option in cases of diarrhea. However, this patient is likely experiencing HUS secondary to an infection with Shiga toxin-producing *E. coli*.

Administration of HBV (Choice C) is recommended to prevent cases of hepatitis B. The patient in this case is presenting with HUS likely secondary to an infection with Shiga toxin-producing *E. coli*.

Administration of immune globulin (Choice D) would not have prevented this patient's condition. Treatment of HUS is largely supportive.

Educational Objective: Hemolytic uremic syndrome is most commonly triggered by an infection with Shiga toxin-producing *Escherichia coli* O157:H7. A patient may be exposed to the pathogen by ingesting contaminated water, fruits, vegetables, or undercooked meat. It typically presents with the triad of microangiopathic hemolytic anemia, thrombocytopenia, and acute kidney injury. Appropriate food preparation will most likely prevent this condition.



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- ✓ 7. A 47-year-old Russian man comes to the physician because of a 3-week history of chest pain after walking three blocks. He describes the pain as a tightness in the left side of his chest. He has hypertension and type 2 diabetes mellitus. Current medications include omeprazole and paroxetine. His pulse is 90/min, and blood pressure is 150/90 mm Hg. Examination shows no abnormalities. Serum studies show a total cholesterol concentration of 230 mg/dL, HDL-cholesterol concentration of 40 mg/dL, and LDL-cholesterol concentration of 170 mg/dL. An ECG shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) X-ray of the chest
 - ☒ B) Exercise stress test
 - ☐ C) Dobutamine stress echocardiography
 - ☐ D) MUGA scan
 - ☐ E) Cardiac catheterization

Correct Answer: B.

This patient's presentation is consistent with angina pectoris. It is most commonly caused by coronary artery disease (CAD) and is usually a result of atherosclerotic plaque buildup. Depending on the degree of coronary artery stenosis, the myocardium may not receive sufficient oxygen to meet its metabolic demands during times of increased work. Patients typically develop symptoms during exertion, heightened emotional states, and after heavy meals. This mismatch in supply and demand of oxygen results in myocardial ischemia and can cause angina, in this case, occurring during prolonged walking. Many individuals with CAD will have anginal chest pain when they exercise, but symptoms abate with adequate rest or the use of nitroglycerin, which decreases the myocardial oxygen demand and decreases the supply-demand mismatch. Stress tests are employed to identify areas of decreased perfusion that may benefit from revascularization, generally via balloon angioplasty and/or stenting. Choosing the type of stress test depends on the functional capacity of the patient, and whether known CAD or baseline abnormalities on ECG exist. There are various types of stress testing that can be conducted, and each has benefits and drawbacks. For example, exercise stress testing on a treadmill is appropriate for patients with normal resting ECGs and an ability to exercise. Nuclear stress tests may be used in cases where the patient has a known abnormal ECG or is unable to exercise. In patients without perfusion-limiting CAD, stress testing will be normal and show no inducible ischemia. In those with perfusion-limiting CAD, abnormalities may be detectable on ECG, echocardiography, or nuclear scanning. Such patients should be considered for prompt revascularization. This patient, who can exercise and has a normal baseline ECG, can be considered for exercise stress testing.



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tests are employed to identify areas of decreased perfusion that may benefit from revascularization, generally via balloon angioplasty and/or stenting. Choosing the type of stress test depends on the functional capacity of the patient, and whether known CAD or baseline abnormalities on ECG exist. There are various types of stress testing that can be conducted, and each has benefits and drawbacks. For example, exercise stress testing on a treadmill is appropriate for patients with normal resting ECGs and an ability to exercise. Nuclear stress tests may be used in cases where the patient has a known abnormal ECG or is unable to exercise. In patients without perfusion-limiting CAD, stress testing will be normal and show no inducible ischemia. In those with perfusion-limiting CAD, abnormalities may be detectable on ECG, echocardiography, or nuclear scanning. Such patients should be considered for prompt revascularization. This patient, who can exercise and has a normal baseline ECG, can be considered for exercise stress testing.

Incorrect Answers: A, C, D, and E.

X-ray of the chest (Choice A) is an appropriate study to evaluate structural causes of chest discomfort, including but not limited to pneumothorax, pneumonia, aortic dissection, pleural effusion, and rib fractures. It is neither sensitive nor specific for CAD and is not the best first step in cases of high pretest probability.

Dobutamine stress echocardiography (Choice C) is an appropriate test in a patient who is unable to exercise. This test involves using dobutamine, a chronotropic and inotropic medication, to increase cardiac workload. Echocardiography is then performed to assess for areas of suboptimally contracting myocardium. This patient can exercise, thus, permitting native exertional stress on the heart is most appropriate.

MUGA scan (Choice D) is a nuclear medicine test used to assess cardiac function such as chamber size and ejection fraction. It is not a stress test and would not permit assessment of whether the patient's heart is being perfused sufficiently under conditions of both stress and rest. It is commonly used in the assessment of heart failure, or to determine cardiac function prior to medical interventions that require sufficient baseline cardiac reserve.

Cardiac catheterization (Choice E) of the left heart is appropriate in cases of known, perfusion-limiting CAD or in cases of acute coronary syndrome. This patient does not yet have known CAD nor evidence of acute coronary syndrome. Catheterization is an otherwise invasive procedure carrying risk for coronary and/or aortic dissection, arrhythmia, hypertensive crisis, acute kidney injury, pain, infection, and bleeding, among others. Until CAD is established, the benefits of conducting catheterization would be outweighed by the risks.

Educational Objective: Angina pectoris presents with exertional or stress-induced chest pain, dyspnea, or anginal-equivalent symptoms. It is caused by perfusion-limiting coronary artery disease. Patients with symptoms of angina pectoris should undergo stress testing to identify perfusion-limiting lesions that may benefit from revascularization.



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✓ 8. A hospitalized 57-year-old woman with type 2 diabetes mellitus has had an increase in her serum creatinine concentration from 1.0 to 2.4 mg/dL during the past 3 days. She was admitted to the hospital 7 days ago for treatment of pneumonia. She had severe shortness of breath and hypotension on admission; she was intubated and mechanically ventilated for 2 days. Six days ago, a CT scan of the chest with contrast showed pneumonia at both lung bases. She is now breathing 3 L/min of oxygen via nasal cannula and has mild shortness of breath. Her blood pressure has been stable for 6 days. Her urine output has been 1 L/d during the past 2 days. Current medications include ceftriaxone, azithromycin, albuterol, insulin, and lisinopril. Pulse oximetry while breathing 3 L/min of oxygen via nasal cannula shows an oxygen saturation of 94%. Crackles are heard at both lung bases. Urinalysis shows:

Protein	1+
RBC	10/hpf
WBC	9/hpf
Casts	none

A Wright stain of urine shows eosinophils. Which of the following is the most likely diagnosis?

- ☐ A) Acute tubular necrosis
- ☐ B) Diabetic nephropathy
- ☒ C) Interstitial nephritis
- ☐ D) Lisinopril-induced renal insufficiency
- ☐ E) Pyelonephritis

Correct Answer: C.

Acute interstitial nephritis (AIN) is caused by a hypersensitivity reaction to medications (eg, NSAIDs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infections, or autoimmune disorders, such as sarcoidosis and systemic lupus erythematosus. Patients may be asymptomatic, but common signs, symptoms, and laboratory findings include rash, azotemia, sterile pyuria, hematuria, and eosinophilia. Patients may have proteinuria but typically not to the extent of nephrotic syndrome. AIN can be complicated by acute kidney injury and a decline in kidney function. Treatment of AIN includes supportive care and discontinuing the offending drug when there is one.

☐ E) Pyelonephritis

Correct Answer: C.

Acute interstitial nephritis (AIN) is caused by a hypersensitivity reaction to medications (eg, NSAIDs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infections, or autoimmune disorders, such as sarcoidosis and systemic lupus erythematosus. Patients may be asymptomatic, but common signs, symptoms, and laboratory findings include rash, azotemia, sterile pyuria, hematuria, and eosinophilia. Patients may have proteinuria but typically not to the extent of nephrotic syndrome. AIN can be complicated by acute kidney injury and a decline in kidney function. Treatment of AIN includes supportive care and discontinuing the offending drug when there is one, which is ceftriaxone in this case. Eosinophils are often detected on urinalysis, as shown in this case.

Incorrect Answers: A, B, D, and E.

Acute tubular necrosis (Choice A) is often caused by ischemic injury due to inadequate perfusion, and can occur because of sepsis, hypovolemia, medication or substance-induced hypotension, or other shock states. Acute tubular necrosis can also be caused by direct cytotoxic injury from nephrotoxins such as myoglobin, hemoglobin, and ethylene glycol. Urinalysis will show pigmented, granular casts composed of tubular epithelium and will generally not contain eosinophils.

Diabetic nephropathy (Choice B) is often present in patients with long-standing diabetes mellitus. Nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles results in compromise of the filtration barrier and increased permeability to solutes and proteins. Urinalysis will show albuminuria; eosinophils in urine would not be typical of this condition.

Lisinopril-induced renal insufficiency (Choice D) classically occurs in the setting of bilateral renal artery stenosis due to the drug causing a decrease in renal perfusion pressure through dilation of the efferent arteriole. Urine studies would not show proteinuria, pyuria, hematuria, or eosinophils. An increase in creatinine would be characteristic.

Pyelonephritis (Choice E) presents with fever, chills, nausea, and abdominal or flank pain, generally following symptoms of a lower urinary tract infection. Urinalysis generally shows bacteriuria and pyuria with neutrophilic predominance. White blood cell casts may be present.

Educational Objective: Acute interstitial nephritis (AIN) is caused by a hypersensitivity reaction to medications (eg, NSAIDs, diuretics, sulfonamides, rifampin, proton pump inhibitors, antibiotics), infections, or autoimmune disorders. Treatment of AIN includes supportive care and discontinuing the offending drug when there is one.



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- ✓ 9. A 6-year-old boy who has cerebral palsy is brought to the office for a routine health maintenance examination. His parents are concerned that he has never been able to walk. The parents report that the child has been healthy and has not had weight loss, developmental regression, change in appetite or activity level, or pain in his joints. The child's mental development seems normal to his parents. The mother says that her son undergoes weekly physical therapy. Today, head circumference is at the 25th percentile for age; height and weight are at the 5th percentile for age. Vital signs are temperature 36.8°C (98.4°F), pulse 90/min, respirations 22/min, and blood pressure 100/60 mm Hg. Examination of the upper extremities shows no abnormalities. Hips are adducted. There is moderate lower extremity spasticity and three beats of clonus at both ankles and knees. The parents are considering educational options for the following year for their son and his twin sister, who is not affected with cerebral palsy. The father asks, "What is the public school's obligation to my children?" Which of the following is the most appropriate response to the parents?
- ☒ A) Their children can go to the same public school and their son's special needs will be accommodated in a regular classroom
 - ☐ B) Their children can go to the same public school but their son will be placed in a special classroom
 - ☐ C) Their son will have to ambulate with assistive devices before he can be placed in a public school
 - ☐ D) Their son will have to be placed in a private school
 - ☐ E) Their son will have to be placed in a school for disabled children

Correct Answer: A.

Cerebral palsy is a disorder of nonprogressive central motor dysfunction due to impaired fetal or neonatal brain development. The cause is frequently multifactorial, though the most important risk factors are premature delivery, which may increase the risk for cerebral palsy 80-fold, and low birth weight. Other risk factors include intrauterine infections, antepartum hemorrhage, placental pathology, multiple pregnancy, heavy maternal alcohol use, maternal smoking, and maternal obesity, though for many of these factors, causality has not been established. Cerebral palsy typically presents with upper motor neuron signs (eg, spasticity), dyskinesia, and/or ataxia, as is seen in this case. All students are entitled to education in the least restrictive environment and should be taught in a regular classroom as much as possible. In this case, the patient has cerebral palsy with mobility restrictions, but he does have a normal mental development per parent report. Education provided in a regular classroom with accommodations would be the most appropriate response to the father's question.

Incorrect Answers: B, C, D, and E.

- ☐ D) Their son will have to be placed in a private school.
- ☐ E) Their son will have to be placed in a school for disabled children

Correct Answer: A.

Cerebral palsy is a disorder of nonprogressive central motor dysfunction due to impaired fetal or neonatal brain development. The cause is frequently multifactorial, though the most important risk factors are premature delivery, which may increase the risk for cerebral palsy 80-fold, and low birth weight. Other risk factors include intrauterine infections, antepartum hemorrhage, placental pathology, multiple pregnancy, heavy maternal alcohol use, maternal smoking, and maternal obesity, though for many of these factors, causality has not been established. Cerebral palsy typically presents with upper motor neuron signs (eg, spasticity), dyskinesia, and/or ataxia, as is seen in this case. All students are entitled to education in the least restrictive environment and should be taught in a regular classroom as much as possible. In this case, the patient has cerebral palsy with mobility restrictions, but he does have a normal mental development per parent report. Education provided in a regular classroom with accommodations would be the most appropriate response to the father's question.

Incorrect Answers: B, C, D, and E.

Their children can go to the same public school but their son will be placed in a special classroom (Choice B) is not the most appropriate response. The school has an obligation to provide education to this student in the least restrictive environment.

Their son will have to ambulate with assistive devices before he can be placed in a public school (Choice C) is not the best response. Mobility accommodations can be made for students so they can participate in regular classrooms.

Their son will have to be placed in a private school (Choice D) is not the correct response to the father's question. Their son has noted deficits in ambulation but has had normal mental development reported by the family. Education in a regular classroom with accommodations would be the most appropriate.

Their son will have to be placed in a school for disabled children (Choice E) is not the correct response. Their child is entitled to education in the least restrictive environment.

Educational Objective: Cerebral palsy is a nonprogressive central motor dysfunction due to impaired fetal or neonatal brain development. All students are entitled to education in the least restrictive environment and should be taught in a regular classroom as much as possible rather than being separated into different classes.



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- ✓ 10. A previously healthy 22-year-old man comes to the physician because he has had watery, nonbloody diarrhea five times daily for 3 days. He also has had nausea, decreased appetite, and abdominal cramps during this period. He returned yesterday from a trip to Mexico. His temperature is 37.5°C (99.5°F), pulse is 80/min, respirations are 14/min, and blood pressure is 128/80 mm Hg. There are no orthostatic blood pressure or pulse changes. The mucous membranes are moist. Abdominal examination shows diffuse mild tenderness to palpation without masses or rebound. Which of the following is the most likely causal organism?
- ☐ A) *Entamoeba histolytica*
 - ☒ B) Enterotoxigenic *Escherichia coli*
 - ☐ C) Rotavirus
 - ☐ D) *Salmonella typhi*
 - ☐ E) *Yersinia enterocolitica*

Correct Answer: B.

This patient is presenting with signs and symptoms of traveler's diarrhea, most commonly caused by enterotoxigenic *Escherichia coli* (ETEC). It is one of the most common causes of bacterial diarrhea in the developing world and is transmitted via the fecal-oral route. Symptoms include acute, diffuse, crampy abdominal pain and bloating, and profuse, frequent episodes of watery, nonbloody diarrhea. ETEC causes diarrhea through the production of bacterial exotoxins. Diagnosis is made with stool culture and microscopy (typically with an absence of blood and stool leukocytes), and treatment is supportive with rehydration and electrolyte repletion. The infection is often self-limiting, though antibiotics may be required in prolonged or severe cases.

Incorrect Answers: A, C, D, and E.

Entamoeba histolytica (Choice A) and *Yersinia enterocolitica* (Choice E) classically present with mucosal inflammation and invasion, leading to a toxic presentation with bloody diarrhea. This patient's watery diarrhea is more consistent with traveler's diarrhea.

Rotavirus (Choice C) causes self-limited nausea, vomiting, and watery diarrhea in children, with nearly 100% of children having been affected by age 5 years. This would be atypical in a patient of this age.



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- ✓ 11. A 27-year-old man who recently received the diagnosis of HIV infection comes to the physician for a routine follow-up examination. He feels well and has had no HIV-related complications. Highly active antiretroviral therapy has not yet been initiated. His childhood immunizations are up-to-date, and he has had no vaccinations during the past 10 years. He has no history of chickenpox during childhood and tested negative for varicella-zoster virus antibodies at his last visit. Examination today shows no abnormalities. His CD4+ T-lymphocyte count is $180/\text{mm}^3$ (Normal ≥ 500), and plasma HIV viral load is 50,000 copies/mL. In addition to avoiding exposure to chickenpox or shingles, which of the following is the most appropriate next step regarding prevention of varicella-zoster infection in this patient?
- ☒ A) Varicella-zoster immune globulin if exposed to chickenpox or shingles
 - ☐ B) Varicella vaccine if exposed to chickenpox or shingles
 - ☐ C) Varicella vaccine at this visit
 - ☐ D) Varicella-zoster immune globulin every 3 months when CD4+ T-lymphocyte count is less than $200/\text{mm}^3$
 - ☐ E) Varicella-zoster immune globulin every 3 months beginning at this visit

Correct Answer: A.

Immunizations are important for individuals with HIV as they have defects in cell-mediated immunity, B-lymphocyte dysfunction, and impaired humoral immune responses. Vaccinations with live viruses (eg, measles, mumps, and rubella [MMR], varicella) should not be administered unless the CD4+ T-lymphocyte count is greater than $200/\text{mm}^3$. If an individual has been exposed to varicella-zoster virus and they are not vaccinated, they may receive the vaccine if they are over 1 year old, not pregnant, and not immunocompromised. If an individual does not meet these criteria, as is the case for this patient, varicella-zoster immune globulin may be administered if the individual is exposed to chickenpox or shingles.

Incorrect Answers: B, C, D, and E.

Varicella vaccine if exposed to chickenpox or shingles (Choice B) would be a reasonable treatment option if an individual was older than 1 year, not pregnant, not immunocompromised, and had not experienced a previous allergic reaction to vaccine components. This patient is immunocompromised; thus, it would be inappropriate to administer the vaccine if exposed.



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- ☐ D) Varicella-zoster immune globulin every 3 months when CD4+ T-lymphocyte count is less than 200/mm³
- ☐ E) Varicella-zoster immune globulin every 3 months beginning at this visit

Correct Answer: A.

Immunizations are important for individuals with HIV as they have defects in cell-mediated immunity, B-lymphocyte dysfunction, and impaired humoral immune responses. Vaccinations with live viruses (eg, measles, mumps, and rubella [MMR], varicella) should not be administered unless the CD4+ T-lymphocyte count is greater than 200/mm³. If an individual has been exposed to varicella-zoster virus and they are not vaccinated, they may receive the vaccine if they are over 1 year old, not pregnant, and not immunocompromised. If an individual does not meet these criteria, as is the case for this patient, varicella-zoster immune globulin may be administered if the individual is exposed to chickenpox or shingles.

Incorrect Answers: B, C, D, and E.

Varicella vaccine if exposed to chickenpox or shingles (Choice B) would be a reasonable treatment option if an individual was older than 1 year, not pregnant, not immunocompromised, and had not experienced a previous allergic reaction to vaccine components. This patient is immunocompromised; thus, it would be inappropriate to administer the vaccine if exposed.

Varicella vaccine at this visit (Choice C) is not the most appropriate next step. This patient has a CD4+ T-lymphocyte count of 180/mm³, which is a contraindication to receiving a live virus vaccination.

Varicella-zoster immune globulin every 3 months when CD4+ T-lymphocyte count is less than 200/mm³ (Choice D) or varicella-zoster immune globulin every 3 months beginning at this visit (Choice E) are not the most appropriate next steps in management. Varicella-zoster immune globulin may be administered to this patient if he is exposed to the varicella-zoster virus. Routine immunoprophylaxis is not required.

Educational Objective: Immunizations are important for individuals with HIV as they have defects in cell-mediated immunity, B-lymphocyte dysfunction, and impaired humoral immune responses. Individuals with HIV are unable to receive vaccines containing live viruses while their CD4+ T-lymphocyte count is less than 200/mm³. If an individual with HIV and a CD4+ T-lymphocyte count less than 200/mm³ is exposed to chickenpox or shingles, they may receive varicella-zoster immune globulin.



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12. A 32-year-old woman is scheduled for elective surgical correction of bladder prolapse. A recent echocardiogram showed mitral valve prolapse but no mitral valve insufficiency. She has no history of serious illness, and she takes no medications on a regular basis. Her temperature is 36.8°C (98.2°F), pulse is 84/min, respirations are 12/min, and blood pressure is 90/58 mm Hg. The lungs are clear to auscultation. A grade 2/6, systolic ejection murmur is heard at the cardiac base, and two early systolic clicks are heard at the left sternal border. Which of the following is the most appropriate antibiotic prophylaxis for this patient?

- ☐ A) Oral administration of amoxicillin 1 hour preoperatively followed by one-half dose 6 hours postoperatively
- ☐ B) Intramuscular administration of ceftriaxone 1 hour preoperatively
- ☐ C) Intravenous administration of amoxicillin and gentamicin 30 minutes preoperatively
- ☒ D) Intravenous administration of vancomycin and gentamicin 1 hour preoperatively
- ☐ E) No antibiotic prophylaxis is needed

Correct Answer: E.

No antibiotic prophylaxis is indicated in this patient with mitral valve prolapse. Antibiotic prophylaxis with amoxicillin given prior to certain dental and surgical procedures is only indicated for patients at the highest risk for severe complications from bacterial endocarditis. Patients who should receive prophylaxis include those with a prior history of endocarditis, those with any type of prosthetic valve, those with unrepaired congenital cyanotic heart disease, those with repaired congenital cyanotic heart disease with prosthetic material or devices within the first 6 months post-repair, and those with repaired congenital cyanotic heart disease with residual defects at or adjacent to a site of prosthetic repair. While rare, patients with valvular disease in a transplanted heart should also be given prophylaxis. Mitral valve prolapse is a structural cardiac disease characterized by abnormal positioning and movement of the mitral valve leaflets into the left atrium during ventricular contraction. It is more common in females. It may be idiopathic or because of hereditary disease and may be present in muscular dystrophies. Patients with mitral valve prolapse without other indications do not require preprocedural antibiotic prophylaxis unless otherwise indicated.

Incorrect Answers: A, B, C, and D.

Oral administration of amoxicillin 1 hour preoperatively followed by one-half dose 6 hours postoperatively (Choice A), intramuscular administration of ceftriaxone 1 hour preoperatively (Choice B), intravenous administration of amoxicillin and gentamicin 30 minutes preoperatively (Choice C) and intravenous administration of vancomycin



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- ☐ B) Intramuscular administration of ceftriaxone 1 hour preoperatively
- ☐ C) Intravenous administration of amoxicillin and gentamicin 30 minutes preoperatively
- ☒ D) Intravenous administration of vancomycin and gentamicin 1 hour preoperatively
- ☐ E) No antibiotic prophylaxis is needed

Correct Answer: E.

No antibiotic prophylaxis is indicated in this patient with mitral valve prolapse. Antibiotic prophylaxis with amoxicillin given prior to certain dental and surgical procedures is only indicated for patients at the highest risk for severe complications from bacterial endocarditis. Patients who should receive prophylaxis include those with a prior history of endocarditis, those with any type of prosthetic valve, those with unrepaired congenital cyanotic heart disease, those with repaired congenital cyanotic heart disease with prosthetic material or devices within the first 6 months post-repair, and those with repaired congenital cyanotic heart disease with residual defects at or adjacent to a site of prosthetic repair. While rare, patients with valvular disease in a transplanted heart should also be given prophylaxis. Mitral valve prolapse is a structural cardiac disease characterized by abnormal positioning and movement of the mitral valve leaflets into the left atrium during ventricular contraction. It is more common in females. It may be idiopathic or because of hereditary disease and may be present in muscular dystrophies. Patients with mitral valve prolapse without other indications do not require preprocedural antibiotic prophylaxis unless otherwise indicated.

Incorrect Answers: A, B, C, and D.

Oral administration of amoxicillin 1 hour preoperatively followed by one-half dose 6 hours postoperatively (Choice A), intramuscular administration of ceftriaxone 1 hour preoperatively (Choice B), intravenous administration of amoxicillin and gentamicin 30 minutes preoperatively (Choice C) and intravenous administration of vancomycin and gentamicin 1 hour preoperatively (Choice D) are all incorrect. There is no specific requirement for antibiotic prophylaxis for mitral valve prolapse. The patient does not require prophylaxis based on the cardiac murmur described, which is consistent with mitral valve prolapse.

Educational Objective: Patients with a prior history of endocarditis, with prosthetic valves, with unrepaired, recent prosthetically repaired, or incompletely repaired congenital cyanotic heart disease, and those with transplanted hearts with prosthetic valves should receive antibiotic prophylaxis against endocarditis prior to certain dental and surgical procedures. The treatment of choice is typically amoxicillin. Patients with mitral valve prolapse without other indications do not require preprocedural antibiotic prophylaxis unless otherwise indicated.



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13. A 27-year-old woman, gravida 1, para 1, comes to the physician 1 day after an episode of light-headedness while she was jogging. She has a long-standing history of heavy menses treated with a prescription iron supplement until 8 months ago. She has had hemorrhoids since the birth of her son 2½ years ago. She is otherwise healthy. Vital signs are within normal limits with no orthostatic changes. Examination shows no abnormalities except a mild flow murmur. Laboratory studies show:

Hemoglobin	8.2 g/dL
Hematocrit	24%
Mean corpuscular volume	76/ μm^3
Leukocyte count	5300/ mm^3

Which of the following is the most appropriate next step in management?

- ☒ A) Oral ferrous sulfate therapy
- ☐ B) Oral multivitamin supplementation
- ☐ C) Transfusion of 2 units of packed red blood cells
- ☐ D) Parenteral ferrous sulfate therapy
- ☐ E) Colonoscopy

Correct Answer: A.

The most likely explanation for the presence of microcytic anemia in this patient with a long-standing history of heavy menses is iron deficiency anemia (IDA). Iron is required for the synthesis of heme, which is a necessary component of the hemoglobin molecule to transport oxygen to peripheral tissues. Common causes of IDA include occult gastrointestinal bleeding, heavy menstruation, limited dietary intake, malabsorption, and malnutrition. Additional iron studies, including serum iron and ferritin concentrations, total iron-binding capacity, and transferrin saturation, can confirm the diagnosis. Peripheral blood smear typically shows erythrocytes that are pale (ie, hypochromic), small in size (ie, microcytic), and normal in shape. The most appropriate next step in management for this patient is oral ferrous sulfate therapy.



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- ☐ B) Parenteral ferrous sulfate therapy
- ☐ E) Colonoscopy

Correct Answer: A.

The most likely explanation for the presence of microcytic anemia in this patient with a long-standing history of heavy menses is iron deficiency anemia (IDA). Iron is required for the synthesis of heme, which is a necessary component of the hemoglobin molecule to transport oxygen to peripheral tissues. Common causes of IDA include occult gastrointestinal bleeding, heavy menstruation, limited dietary intake, malabsorption, and malnutrition. Additional iron studies, including serum iron and ferritin concentrations, total iron-binding capacity, and transferrin saturation, can confirm the diagnosis. Peripheral blood smear typically shows erythrocytes that are pale (ie, hypochromic), small in size (ie, microcytic), and normal in shape. The most appropriate next step in management for this patient is oral ferrous sulfate therapy.

Incorrect Answers: B, C, D, and E.

Oral multivitamin supplementation (Choice B) is not the most appropriate next step in management for this patient. Because of her history of heavy menses, discontinuation of iron supplementation 8 months ago, and laboratory studies showing microcytic anemia, treatment with oral ferrous sulfate is the most appropriate next step in management.

Transfusion of 2 units of packed red blood cells (Choice C) is not the most appropriate step in management for this patient. Transfusion is typically indicated for patients with a hemoglobin of less than 7 g/dL without signs of active bleeding.

Parenteral ferrous sulfate therapy (Choice D) is not the most appropriate next step in management. Intravenous supplementation of iron may be used in cases when a patient has gastrointestinal side effects to oral supplementation or has a history of decreased gastrointestinal absorption of oral supplementation.

Colonoscopy (Choice E) may be a reasonable step in management if a clear source of microcytic anemia has not been identified. This patient has a history of heavy menses which is a known cause of microcytic anemia. Treatment with oral ferrous sulfate is the most appropriate next step in management.

Educational Objective: Iron deficiency is the most common cause of microcytic anemia. Common causes of iron deficiency anemia include occult gastrointestinal bleeding, heavy menstruation, limited dietary intake, malabsorption, and malnutrition. In the case of a patient with a history of heavy menstrual bleeding, treatment with oral ferrous sulfate is the most appropriate next step in management.



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- ✓ 14. A 14-year-old girl is brought to the physician for a well-child examination. She appears well nourished. Menarche has not occurred. She is at the 35th percentile for height and weight. She has grown 8 cm during the past year. On examination, breast and pubic hair development are sexual maturity rating stage 3. The patient is concerned because all of her friends have begun menstruating and appear more developed than she does. Which of the following is the most appropriate next step in management?
- ☒ A) Reassurance that the patient is developing normally
 - ☐ B) Karyotype analysis
 - ☐ C) Measurement of serum luteinizing hormone and follicle-stimulating hormone concentrations
 - ☐ D) X-rays of the wrist and hand to determine bone age
 - ☐ E) Pelvic examination

Correct Answer: A.

Reassurance that the patient is developing normally is most appropriate at this time. Puberty in girls follows a predictable course of thelarche (breast development), followed by pubarche (pubic hair growth) and a growth spurt, and finally menarche (the start of menstruation); however, there exists variability around the ages at which any individual patient will reach each phase of puberty. Primary amenorrhea is described as the absence of menarche at age 15 years with appropriate secondary sex characteristics or at age 13 years without secondary sex characteristics. Prior to this, amenorrhea is not considered pathologic. Some causes of primary amenorrhea include functional hypothalamic amenorrhea, constitutional delays of puberty, gonadal dysgenesis (eg, Turner syndrome), müllerian agenesis, hyperprolactinemia, gonadotropin-releasing hormone deficiency, polycystic ovary syndrome, and imperforate hymen. This patient is 14 years old and shows secondary sex characteristics. She does not meet the definition for primary amenorrhea, and her amenorrhea is likely a normal variant in her pubertal development.

Incorrect Answers: B, C, D, and E.

Karyotype analysis (Choice B) would be appropriate if the patient was experiencing amenorrhea and signs of a genetic abnormality such as Turner syndrome were present. This patient shows normal secondary sex characteristics and no signs of abnormal development.



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☐ E) Pelvic examination

Correct Answer: A.

Reassurance that the patient is developing normally is most appropriate at this time. Puberty in girls follows a predictable course of thelarche (breast development), followed by pubarche (pubic hair growth) and a growth spurt, and finally menarche (the start of menstruation); however, there exists variability around the ages at which any individual patient will reach each phase of puberty. Primary amenorrhea is described as the absence of menarche at age 15 years with appropriate secondary sex characteristics or at age 13 years without secondary sex characteristics. Prior to this, amenorrhea is not considered pathologic. Some causes of primary amenorrhea include functional hypothalamic amenorrhea, constitutional delays of puberty, gonadal dysgenesis (eg, Turner syndrome), müllerian agenesis, hyperprolactinemia, gonadotropin-releasing hormone deficiency, polycystic ovary syndrome, and imperforate hymen. This patient is 14 years old and shows secondary sex characteristics. She does not meet the definition for primary amenorrhea, and her amenorrhea is likely a normal variant in her pubertal development.

Incorrect Answers: B, C, D, and E.

Karyotype analysis (Choice B) would be appropriate if the patient was experiencing amenorrhea and signs of a genetic abnormality such as Turner syndrome were present. This patient shows normal secondary sex characteristics and no signs of abnormal development.

Measurement of serum luteinizing hormone and follicle-stimulating hormone concentrations (Choice C) would be appropriate if there was evidence of an endocrine cause of amenorrhea. Such testing may be appropriate if this patient does not have a menstrual period by age 15 years. At present, however, it would be premature.

X-rays of the wrist and hand to determine bone age (Choice D) could be appropriate if a constitutional growth delay/delay in puberty were suspected. This patient shows physical characteristics appropriate for her age.

Pelvic examination (Choice E) is indicated in the evaluation of amenorrhea if a structural cause, such as imperforate hymen, is suspected. This patient reports no abdominopelvic pain and appears to have appropriately entered puberty. She does not yet meet age cutoffs for investigation of amenorrhea.

Educational Objective: Primary amenorrhea refers to the absence of menarche at age 15 years despite the presence of secondary sex characteristics or at age 13 years without the presence of secondary sex characteristics. Evaluation is appropriate for patients who meet this definition, though for those showing normal development within appropriate age ranges, reassurance and monitoring are most appropriate.



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- ✓ 15. An 18-year-old woman comes to the physician because of a 5-year history of recurrent, painful sores in her mouth and vagina. Multiple over-the-counter topical preparations have provided only temporary resolution of the sores. She is unable to identify any predisposing factors. One year ago, she had an episode of "walking pneumonia" treated with azithromycin. She has been otherwise healthy. Her mother has type 2 diabetes mellitus but is otherwise well. The patient has never been sexually active. Her temperature is 37°C (98.6°F), pulse is 84/min, respirations are 16/min, and blood pressure is 132/72 mm Hg. Examination shows scattered white plaques over the buccal mucosa and palate that are friable and bleed when scraped with a cotton swab. The toenails are yellow and thickened. Pelvic examination shows thick, white vaginal discharge and erythematous vaginal mucosa. There is mild cervical motion tenderness and no adnexal tenderness or masses. Which of the following is the most likely cause of this patient's condition?
- ☐ A) Combined hypogammaglobulinemia
 - ☒ B) Defect in cell-mediated immunity
 - ☐ C) Hyperglycemia
 - ☐ D) IgA deficiency
 - ☐ E) Recent antibiotic use

Correct Answer: B.

The patient in this case is presenting with symptoms of oral and vaginal candidiasis as well as a 5-year history of recurrent *Candida* infections, with the most likely cause being a defect in cell-mediated immunity. Oral candidiasis shows thick, white plaques on the tongue or buccal mucosa that can be scraped off with a tongue blade. It may cause dysphagia (trouble swallowing) or odynophagia (pain with swallowing), especially if esophageal candidiasis is present. It is commonly seen in immunosuppressed individuals with a defect in cell-mediated immunity. *Candida albicans* is a ubiquitous dimorphic fungus that causes a wide spectrum of clinical diseases in immunocompetent hosts such as infections of moist skin folds (intertrigo), vaginal infections, and oral thrush. In patients who are immunocompromised, such as those with HIV/AIDS, neutropenic patients on chemotherapy, or those with poorly controlled diabetes mellitus, *C. albicans* may also cause severe oral candidiasis, esophageal candidiasis, or even invasive fungemia.

Incorrect Answers: A, C, D, and E.

Combined hypogammaglobulinemia (Choice A) is seen in conditions such as X-linked agammaglobulinemia. X-linked agammaglobulinemia occurs as a result of mutations

Correct Answer: B.

The patient in this case is presenting with symptoms of oral and vaginal candidiasis as well as a 5-year history of recurrent *Candida* infections, with the most likely cause being a defect in cell-mediated immunity. Oral candidiasis shows thick, white plaques on the tongue or buccal mucosa that can be scraped off with a tongue blade. It may cause dysphagia (trouble swallowing) or odynophagia (pain with swallowing), especially if esophageal candidiasis is present. It is commonly seen in immunosuppressed individuals with a defect in cell-mediated immunity. *Candida albicans* is a ubiquitous dimorphic fungus that causes a wide spectrum of clinical diseases in immunocompetent hosts such as infections of moist skin folds (intertrigo), vaginal infections, and oral thrush. In patients who are immunocompromised, such as those with HIV/AIDS, neutropenic patients on chemotherapy, or those with poorly controlled diabetes mellitus, *C. albicans* may also cause severe oral candidiasis, esophageal candidiasis, or even invasive fungemia.

Incorrect Answers: A, C, D, and E.

Combined hypogammaglobulinemia (Choice A) is seen in conditions such as X-linked agammaglobulinemia. X-linked agammaglobulinemia occurs as a result of mutations in the BTK gene that encodes a tyrosine kinase essential for all stages of B-lymphocyte development and proliferation. Patients lack functioning B lymphocytes and therefore have recurrent infections due to impaired humoral immunity. They do not typically demonstrate susceptibility to viral or fungal infections, which are typically combated by T lymphocytes or cell-mediated immunity.

Hyperglycemia (Choice C) is a risk factor for developing oral and vaginal candidiasis. The patient in this case has been healthy despite a reported family history of type 2 diabetes mellitus. Because of the duration of her symptoms and lack of uncontrolled diabetes mellitus, a defect in cell-mediated immunity is the more likely cause of this patient's recurring symptoms.

IgA deficiency (Choice D) can be asymptomatic or can present with recurrent sinopulmonary infections and anaphylaxis to blood products. Diagnosis is made by measuring a low or absent concentration of IgA in the serum. The patient in this case most likely has a defect in cell-mediated immunity due to recurrent *Candida* infections.

Recent antibiotic use (Choice E) is a risk factor for developing vulvovaginal candidiasis. However, the patient in this case was treated with azithromycin 1 year ago, which would not explain her long-term, recurrent symptoms.

Educational Objective: Infection with *Candida albicans* may cause local mucous membrane infections to widespread disease. Oral candidiasis may develop after recent treatment with antibiotics or chemotherapy, or in those with a defect in cell-mediated immunity.



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✓ 16. A previously healthy 23-year-old woman comes to the physician because of a 3-week history of seeing images after she looks at the television. She occasionally sees colored streaks out of the corners of her eyes. She experimented with a variety of illicit drugs from the ages of 15 to 22 years but has not used any since then. Her temperature is 37°C (98.6°F), pulse is 74/min, respirations are 16/min, and blood pressure is 110/70 mm Hg. On mental status examination, there is no evidence of auditory hallucinations, delusions, or paranoid thinking. Her serum thyroid-stimulating hormone concentration is 3.4 µU/mL. Urine toxicology screening is negative. Which of the following substances is the most likely cause of this patient's symptoms?

- ☐ A) Ecstasy (3,4-methylenedioxymethamphetamine)
- ☐ B) γ-Hydroxybutyrate
- ☒ C) LSD
- ☐ D) PCP (phencyclidine)
- ☐ E) Peyote (*Lophophora williamsii*)

Correct Answer: C.

LSD is a potent hallucinogen. It is known to cause auditory and visual hallucinations, depersonalization, flashbacks, and paranoia. In addition, patients may experience synesthesia or blending of their senses. LSD may cause hallucinogen-persisting perception disorder, which results in lasting symptoms, including various visual perceptions, that interfere with daily function. The visual perceptions present in this case are most likely caused by previous use of LSD.

Incorrect Answers: A, B, D, and E.

Ecstasy (3,4-methylenedioxymethamphetamine) (Choice A) is a psychotherapeutic agent and commonly used recreational drug. It is a stimulant that causes feelings of increased energy, euphoria, and disinhibition. LSD is the more likely cause of this patient's symptoms.

γ-Hydroxybutyrate (Choice B), also known as GHB, is a central nervous system depressant that is commonly used recreationally. It may cause euphoria, drowsiness, and visual hallucinations as well as impair memory. The symptoms in this case are more likely due to previous use of LSD.



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- ☒ C) LSD
- ☐ D) PCP (phencyclidine)
- ☐ E) Peyote (*Lophophora williamsii*)

Correct Answer: C.

LSD is a potent hallucinogen. It is known to cause auditory and visual hallucinations, depersonalization, flashbacks, and paranoia. In addition, patients may experience synesthesia or blending of their senses. LSD may cause hallucinogen-persisting perception disorder, which results in lasting symptoms, including various visual perceptions, that interfere with daily function. The visual perceptions present in this case are most likely caused by previous use of LSD.

Incorrect Answers: A, B, D, and E.

Ecstasy (3,4-methylenedioxymethamphetamine) (Choice A) is a psychotherapeutic agent and commonly used recreational drug. It is a stimulant that causes feelings of increased energy, euphoria, and disinhibition. LSD is the more likely cause of this patient's symptoms.

γ-Hydroxybutyrate (Choice B), also known as GHB, is a central nervous system depressant that is commonly used recreationally. It may cause euphoria, drowsiness, and visual hallucinations as well as impair memory. The symptoms in this case are more likely due to previous use of LSD.

PCP (phencyclidine) (Choice D) is an *N*-methyl-*D*-aspartate glutamatergic receptor antagonist that is used recreationally for its euphoria-inducing and dissociative effects. PCP intoxication is often characterized by signs and symptoms including hyperthermia, hypertension, tachycardia, erratic behavior, paranoia, psychosis, aggression, decreased sensation, ataxia, nystagmus, myoclonus, and dysarthria. This patient's symptoms are more suggestive of previous LSD use.

Peyote (*Lophophora williamsii*) (Choice E) is a small cactus that is native to the southwest United States and northern Mexico. Mescaline is produced by the cactus, which causes similar, although milder, effects as LSD. LSD is the more likely cause of the persisting symptoms in this case.

Educational Objective: LSD is a potent hallucinogen known to cause auditory and visual hallucinations, depersonalization, flashbacks, and paranoia. LSD may cause hallucinogen-persisting perception disorder, which may cause lasting effects.



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17. A 42-year-old man comes to the physician because of intermittent lower abdominal pain, diarrhea, and a 6.8-kg (15-lb) weight loss during the past year. He says that he tires easily. During the past 2 years, he has had a recurrent perirectal abscess treated with antibiotic therapy. Currently, his only medication is a daily multivitamin. He does not appear to be in acute distress. He is 180 cm (5 ft 11 in) tall and weighs 79 kg (175 lb); BMI is 24 kg/m². His temperature is 37.2°C (99°F), pulse is 84/min, respirations are 16/min, and blood pressure is 145/75 mm Hg. Cardiopulmonary examination shows no abnormalities. A mildly tender abdominal mass is palpated in the right lower quadrant. Results of a barium enema are shown. Which of the following is the most likely diagnosis?

- ☐ A) Antibiotic-associated colitis
- ☐ B) Cecal cancer
- ☒ C) Crohn disease
- ☐ D) Gastroenteritis
- ☐ E) Ulcerative colitis

Correct Answer: C.

Crohn disease is characterized by transmural inflammation that can involve any portion of the gastrointestinal tract, manifesting with skip lesions. It particularly involves the terminal ileum and typically spares the rectum. Clinically, it can present with chronic abdominal pain, low-grade fever, weight loss, and watery or bloody diarrhea. Physical examination findings of Crohn disease include perianal fissures/fistulas, abdominal tenderness especially in the right lower quadrant, and possible positive fecal occult blood, although bloody stools are not required for diagnosis. Colonoscopy can show aphthous or linear ulcers with luminal strictures, inflammatory lesions, and a cobblestone mucosa. Biopsy is required for definitive diagnosis. A barium enema, such as the one included in this case, can show narrowing and stricture of the terminal ileum.

Incorrect Answers: A, B, D, and E.

Antibiotic-associated colitis (Choice A) is caused by *Clostridium difficile*, a gram-positive anaerobe that classically presents with colitis when commensal colonic bacteria are eliminated by antibiotics and is a frequent nosocomial infection. *C. difficile* presents with watery diarrhea, abdominal pain, fever, and leukocytosis, often in the setting of antibiotic use. Physical examination may show tenderness to palpation of the abdomen. This patient is presenting with chronic, not acute, diarrhea, making antibiotic-associated colitis unlikely.



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Correct Answer: C.

Crohn disease is characterized by transmural inflammation that can involve any portion of the gastrointestinal tract, manifesting with skip lesions. It particularly involves the terminal ileum and typically spares the rectum. Clinically, it can present with chronic abdominal pain, low-grade fever, weight loss, and watery or bloody diarrhea. Physical examination findings of Crohn disease include perianal fissures/fistulas, abdominal tenderness especially in the right lower quadrant, and possible positive fecal occult blood, although bloody stools are not required for diagnosis. Colonoscopy can show aphthous or linear ulcers with luminal strictures, inflammatory lesions, and a cobblestone mucosa. Biopsy is required for definitive diagnosis. A barium enema, such as the one included in this case, can show narrowing and stricture of the terminal ileum.

Incorrect Answers: A, B, D, and E.

Antibiotic-associated colitis (Choice A) is caused by *Clostridium difficile*, a gram-positive anaerobe that classically presents with colitis when commensal colonic bacteria are eliminated by antibiotics and is a frequent nosocomial infection. *C. difficile* presents with watery diarrhea, abdominal pain, fever, and leukocytosis, often in the setting of antibiotic use. Physical examination may show tenderness to palpation of the abdomen. This patient is presenting with chronic, not acute, diarrhea, making antibiotic-associated colitis unlikely.

Cecal cancer (Choice B) is often asymptomatic until late in the course. It is classically associated with occult gastrointestinal bleeding and iron deficiency anemia. This patient's chronic symptoms, terminal ileum involvement, and recurrent perirectal abscesses are more associated with Crohn disease.

Gastroenteritis (Choice D) is a common, typically self-limiting illness characterized by nausea, vomiting, diarrhea, and mild abdominal discomfort. It does not cause narrowing or stricture of the terminal ileum. This patient's symptoms are chronic, not acute or self-limiting.

Ulcerative colitis (Choice E) is a chronic inflammatory condition within the spectrum of inflammatory bowel disease that results in inflammation and ulcers of the colonic mucosa, typically beginning with the rectum and advancing proximally. Similar to Crohn disease, symptoms of ulcerative colitis include chronic abdominal pain, weight loss, bloody diarrhea, abdominal bloating, and tenesmus. However, ulcerative colitis starts distally and advances proximally, whereas this patient has mostly terminal ileum involvement, which is most common with Crohn disease.

Educational Objective: Crohn disease is characterized by transmural inflammation that can involve any portion of the gastrointestinal tract, and particularly involves the terminal ileum. Clinically, it can present with chronic abdominal pain, low-grade fever, weight loss, and watery or bloody diarrhea.



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18. A 72-year-old man is brought to the physician by his wife because of a 5-year history of progressive, waxy, dry, scaly lesions over his back. He has no history of serious illness or known allergies. His only medication is 81-mg aspirin. Examination shows approximately 20 nonpruritic lesions scattered over the back; the lesions range from 1 to 4 cm in diameter. A photograph of one of the lesions is shown. Which of the following is the most appropriate next step in management?

- ☒ A) Repeat examination in 12 months
- ☐ B) Topical imiquimod therapy
- ☐ C) Topical triamcinolone therapy
- ☐ D) Punch biopsy
- ☐ E) Wide excisional biopsy

Correct Answer: A.

This patient's lesion is consistent with a seborrheic keratosis. Repeat examination in 12 months is recommended for patients with benign skin findings, including seborrheic keratoses. Seborrheic keratoses are benign neoplasms found in locations of previous sun exposure in middle-aged and older adults. Seborrheic keratoses present as round to ovoid, brown, sharply demarcated, verrucous papules. Seborrheic keratoses are commonly confused as melanocytic growths; however, they originate from overgrowth and retention of keratinocytes within the epidermis. Unlike melanocytic growths, seborrheic keratoses are not associated with malignant potential and are monitored clinically. If they become inflamed or symptomatic, they may be managed with cryotherapy, electrodesiccation and curettage, or excision.

Incorrect Answers: B, C, D, and E.

Topical imiquimod therapy (Choice B), a toll-like receptor 7 agonist, triggers an immune-mediated response. Imiquimod is used in the treatment of dermatologic conditions including actinic keratoses, superficial basal cell carcinoma, lentigo maligna, and viral warts. Topical imiquimod therapy is not used for the treatment of benign seborrheic keratoses.

Topical triamcinolone therapy (Choice C) is used to treat inflammatory conditions of the skin, including psoriasis. Triamcinolone is a topical corticosteroid that is compounded into low potency, medium potency, or high potency formulations that are applied to areas of dermatitis. Skin atrophy, development of striae, and hypopigmentation are adverse effects of topical corticosteroids when they are used long term. This patient's lesion is consistent with a seborrheic keratosis, as opposed to

✓ 19. A 6-week-old boy is brought to the emergency department by paramedics after his father found the patient with his eyes rolled back and gasping for air 15 minutes after being put down for a nap. When paramedics arrived, the patient was limp and not breathing. They performed cardiopulmonary resuscitation and intubated him at the scene. Ten minutes later, his pulse was 166/min. The father reports that earlier the child had been fussy and had nasal congestion. The patient was born at term following a forceps-assisted vaginal delivery. On arrival, the patient remains intubated and ventilated by hand-valve mask; there is occasional spontaneous respiratory effort. His temperature is 35.4°C (95.7°F), pulse is 184/min, respirations are 30/min, and blood pressure is 56/34 mm Hg. Examination of the head shows a tense anterior fontanel that is slightly bulging with sutures separated by 3 mm. The pupils are 5 mm and react sluggishly to light. Fundoscopic examination shows retinal hemorrhages bilaterally. There is no gag reflex. Deep tendon reflexes are absent throughout; there are no spontaneous movements. The patient does not open his eyes in response to verbal or noxious stimuli; there is minimal movement of the hands and feet in response to noxious stimuli. Which of the following is the most likely diagnosis?

- ☐ A) Aspiration with respiratory arrest
- ☐ B) Meningitis
- ☒ C) Nonaccidental trauma
- ☐ D) Seizure
- ☐ E) Sepsis
- ☐ F) Subdural hematoma from forceps
- ☐ G) Sudden infant death syndrome

Correct Answer: C.

Severe intracranial injury with a history that is inconsistent with the severity of the patient's physical findings on examination raises suspicion for abusive head trauma and nonaccidental trauma. Patients with abusive head trauma can present with encephalopathy, apnea, seizures, and retinal hemorrhages, and can have associated injuries such as rib fractures, long bone fractures, or skull fractures. Risk factors for nonaccidental trauma include unstable family situations, prior history of abuse, major birth defects, and parental depression. The mechanism of abusive head trauma in cases such as this is typically blunt force trauma or shaking, which results in an acceleration-deceleration force on an infant. Infants are more vulnerable to deceleration injury due to several factors. The large head and weak neck musculature result in greater



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such as rib fractures, long bone fractures, or skull fractures. Risk factors for nonaccidental trauma include unstable family situations, prior history of abuse, major birth defects, and parental depression. The mechanism of abusive head trauma in cases such as this is typically blunt force trauma or shaking, which results in an acceleration-deceleration force on an infant. Infants are more vulnerable to deceleration injury due to several factors. The large head and weak neck musculature result in greater movement of the brain in the intracranial space when acted on by acceleration and deceleration force, such as in shaking. In addition, the infant skull is thin and flat, allowing forces to transfer through the skull to the brain. Findings on CT scan associated with nonaccidental head trauma include subdural hemorrhage, especially multiple hemorrhages or those in an interhemispheric or posterior fossa location, hypoxic-ischemic injury, and cerebral edema.

Incorrect Answers: A, B, D, E, F, and G.

Aspiration with respiratory arrest (Choice A) is a mechanism of apnea in an infant; however, in a case of apnea, the examination findings of bulging fontanel and retinal hemorrhages would not be present. Findings such as these suggest nonaccidental trauma.

Meningitis (Choice B) in an infant classically presents with fever, altered mental status, neck stiffness, bulging fontanel, and rash, though is often nonspecific early in the disease course. Similarly, sepsis (Choice E) classically presents with fever, tachycardia, tachypnea, and signs or symptoms of preceding infection though is often nonspecific. This patient lacks features to suggest any infectious process other than a mild upper respiratory illness.

Seizure (Choice D) is a potential diagnosis given the description of eyes rolling backwards and gasping; however, such activity would be explained by the presence of intracranial bleeding or cerebral edema as a complication. With signs of increased intracranial pressure and retinal hemorrhages, this clinical picture is most consistent with a cause of nonaccidental trauma.

Subdural hematoma from forceps (Choice F) can occur; however, such a presentation would have been present from the time of forceps delivery. This patient has had a normal neonatal period otherwise, until this episode.

Sudden infant death syndrome (Choice G) is a recognized cause of neonatal mortality, generally occurring during sleep. Children who experience sudden infant death syndrome do not have abnormalities on examination such as bulging fontanel and retinal hemorrhages.

Educational Objective: Severe intracranial injury with a history that is inconsistent with the severity of the patient's physical findings on examination raises suspicion for abusive head trauma and nonaccidental trauma. Patients with abusive head trauma can present with encephalopathy, apnea, seizures, and retinal hemorrhages, and can have associated injuries such as rib fractures, long bone fractures, or skull fractures. The mechanism of abusive head trauma is typically inflicted by blunt force trauma or shaking, which results in an acceleration-deceleration force on an infant.



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20. A 72-year-old woman is brought to the emergency department by paramedics 40 minutes after she had a generalized tonic-clonic seizure. On arrival, she is mildly lethargic but able to answer questions. She says she had been feeling well prior to the seizure. She has hypertension and type 2 diabetes mellitus. She had breast cancer treated with lumpectomy and radiation therapy 12 years ago. Medications are lisinopril, atenolol, and glyburide. Her temperature is 36.3°C (97.4°F), pulse is 72/min, respirations are 22/min, and blood pressure is 130/70 mm Hg. Pupils are equal and reactive to light. The lungs are clear to auscultation. Cardiac examination shows no abnormalities. Examination of the left upper and lower extremities shows clonus. On the left, muscle strength is 4/5, deep tendon reflexes are 3+, and Babinski sign is present. Examination of the right upper and lower extremities shows no abnormalities. A CT scan of the head is shown. Intravenous phenytoin is administered. Which of the following is the most appropriate next step in management?

- ☒ A) Administration of dexamethasone
- ☐ B) Administration of mannitol
- ☐ C) Administration of metronidazole, ampicillin, and ceftriaxone
- ☐ D) Intubation and mechanical ventilation
- ☐ E) Radiation therapy of the right parietal lobe

Correct Answer: A.

This patient presents after a generalized tonic-clonic seizure, lethargic but oriented and protecting her airway. She has a remote history of malignancy. Her neurologic examination localizes a lesion to her right parietal lobe, with upper motor neuron features. Her CT scan shows a mass in the right parietal lobe with surrounding edema. In addition to prevention of further seizures, emergent administration of dexamethasone, a corticosteroid, is indicated to treat and prevent further central nervous system edema. Corticosteroids decrease peri-tumor inflammation and edema, preventing further dysfunction and/or compression of functional cerebral tissue. Corticosteroid administration acts as a bridge to definitive therapy in such cases, which may include radiation or neurosurgery.

Incorrect Answers: B, C, D, and E.

Administration of mannitol (Choice B) is indicated in cases of increased intracranial pressure with signs of impending herniation. In this case, the patient has edema



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In addition to prevention of further seizures, emergent administration of dexamethasone, a corticosteroid, is indicated to treat and prevent further central nervous system edema. Corticosteroids decrease peri-tumor inflammation and edema, preventing further dysfunction and/or compression of functional cerebral tissue. Corticosteroid administration acts as a bridge to definitive therapy in such cases, which may include radiation or neurosurgery.

Incorrect Answers: B, C, D, and E.

Administration of mannitol (Choice B) is indicated in cases of increased intracranial pressure with signs of impending herniation. In this case, the patient has edema surrounding a tumor visible on CT scan, however there is no sign of impending herniation in this case. There is effacement of sulci of the right parietal lobe, but the ventricles are patent and remaining neuroanatomy is within appropriate position.

Administration of metronidazole, ampicillin, and ceftriaxone (Choice C) may be appropriate in cases of central nervous system abscess. Abscesses are notable on imaging as ring-enhancing lesions and may appear similar to a tumor with surrounding edema, however this patient's history supports a metastatic lesion as opposed to an infectious cause. She reported no fever, headache, or any infectious symptom leading up to the abrupt presentation.

Intubation and mechanical ventilation (Choice D) are not indicated at this time. The patient is awake and responding, with no clear threat to the patency of her airway. If she has another seizure that does not abort with antiepileptic medication, aspirates, or develops another airway threat, intubation and ventilation could be indicated at that time.

Radiation therapy of the right parietal lobe (Choice E) may be indicated in this case. However, the most appropriate next step is to take immediate measures to improve the patient's symptoms and prevent complications and further damage. Planning radiotherapy requires hours, whereas administration of corticosteroids can occur within minutes so that any beneficial effect may be experienced while planning further intervention.

Educational Objective: Emergent administration of corticosteroids, such as dexamethasone, is indicated in cases of compressive nervous system lesions with associated edema. Corticosteroids decrease peri-tumor inflammation and edema, preventing further dysfunction and/or compression of functional tissue. Corticosteroid administration acts as a bridge to definitive therapy in such cases, which may include radiation or neurosurgery.



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- ✓ 21. A 32-year-old woman comes to the physician because of severe **chapped skin and bleeding** of her hands. Since she and her husband divorced 6 months ago, she has had an increasing preoccupation with cleanliness and hygiene. She repeatedly washes her hands after touching anything she believes may be contaminated. She acknowledges that the hand washing is excessive, but when she tries to stop she becomes anxious and feels compelled to wash even more to make up for the omission. Vital signs are within normal limits. Physical examination shows chapped and erythematous hands. No other abnormalities are noted. Mental status examination shows an anxious and depressed mood and dysphoric affect. On further questioning, the patient says she prefers not to go to counseling but is willing to try a medication. Which of the following is the most appropriate pharmacotherapy?
- ☐ A) Alprazolam
 - ☐ B) Buspirone
 - ☐ C) Clonazepam
 - ☐ D) Risperidone
 - ☒ E) Sertraline

Correct Answer: E.

Obsessive-compulsive disorder (OCD) is an anxiety disorder typically characterized by obsessions (unwanted, intrusive thoughts that produce anxiety) that the patient attempts to neutralize with compulsions (repetitive behaviors). By definition, the compulsions are excessive or do not realistically address the obsessive fears, and patients commonly recognize the irrationality of their compulsions. This patient's worry about contamination represents an obsession, while her repeated hand washing represents a compulsion. Treatment includes high doses of selective serotonin reuptake inhibitors (SSRIs; eg, sertraline) or cognitive behavioral therapy with a focus on exposure to the discomfort of suppressing the compulsion after experiencing the obsession. SSRIs have the lowest adverse effect burden of antidepressant medications.

Incorrect Answers: A, B, C, and D.

Alprazolam (Choice A) and clonazepam (Choice C) are benzodiazepine medications used for acute anxiety, alcohol withdrawal, and seizures. Benzodiazepines are not

☐ D) Risperidone☒ E) Sertraline

Correct Answer: E.

Obsessive-compulsive disorder (OCD) is an anxiety disorder typically characterized by obsessions (unwanted, intrusive thoughts that produce anxiety) that the patient attempts to neutralize with compulsions (repetitive behaviors). By definition, the compulsions are excessive or do not realistically address the obsessive fears, and patients commonly recognize the irrationality of their compulsions. This patient's worry about contamination represents an obsession, while her repeated hand washing represents a compulsion. Treatment includes high doses of selective serotonin reuptake inhibitors (SSRIs; eg, sertraline) or cognitive behavioral therapy with a focus on exposure to the discomfort of suppressing the compulsion after experiencing the obsession. SSRIs have the lowest adverse effect burden of antidepressant medications.

Incorrect Answers: A, B, C, and D.

Alprazolam (Choice A) and clonazepam (Choice C) are benzodiazepine medications used for acute anxiety, alcohol withdrawal, and seizures. Benzodiazepines are not effective long-term medications for anxiety disorders, as they prevent the extinction of the fear response to the feared situation. When benzodiazepines are used on an as-needed basis, they sometimes prevent the patient from learning they can cope with the situation without the benzodiazepine.

Buspirone (Choice B) is a serotonin modulator used to treat generalized anxiety disorder. It has no proven efficacy in OCD.

Risperidone (Choice D) is an atypical antipsychotic medication used to treat schizophrenia. It is occasionally used as an adjunct for refractory OCD. However, this treatment-naïve patient should try an SSRI first.

Educational Objective: Obsessive-compulsive disorder (OCD) is an anxiety disorder typically characterized by obsessions (unwanted, intrusive thoughts that produce anxiety) that the patient attempts to neutralize with compulsions (repetitive behaviors). First-line treatment of OCD includes high doses of selective serotonin reuptake inhibitors, such as sertraline, or cognitive behavioral therapy with a focus on exposure to the discomfort of suppressing the compulsion after experiencing the obsession.

- ✓ 22. Researchers plan to conduct a meta-analysis to compare the efficacy of two treatments (A and B) on the incidence of hip fractures in women with osteoporosis over the age of 75 years. Informed consent is not obtained for the meta-analysis. Researchers collect data from published studies of randomized trials. The researchers conclude that Treatment A decreases the incidence of hip fractures compared with Treatment B (results are statistically significant). Which of the following study features raises the most concern about this conclusion?
- ☐ A) Data cannot be combined from different studies
 - ☐ B) Hip fracture is an unreliable outcome measure
 - ☐ C) It is unethical to include patients in this type of study without their consent
 - ☒ D) Limiting the analysis to published medical literature introduces bias
 - ☐ E) Randomized trials should not be used in a meta-analysis

Correct Answer: D.

Limiting the analysis to published medical literature increases the potential for publication bias in the meta-analysis. Publication bias favors studies that show statistically significant results or outcomes and leads to a higher publication rate of successful therapies compared to unsuccessful therapies. In this case, there may be other variables that account for the differences in published results for treatment A versus treatment B. For example, one treatment may have had a larger trial prior to medication approval, have been approved for a longer period, or have more follow-up data following treatment approval. Statistical measures to analyze the risk for publication bias are recommended as part of a meta-analysis, which are not presented in the vignette.

Incorrect Answers: A, B, C, and E.

Data cannot be combined from different studies (Choice A) is incorrect. Meta-analyses aggregate large sums of data to investigate a clinical outcome or result, compared to other treatments. Meta-analyses are clinically useful, especially when they compare the efficacy of one treatment versus alternatives.

Hip fracture is an unreliable outcome measure (Choice B) is incorrect. Hip fracture represents a poor outcome in patients with osteoporosis, which is associated with a high morbidity and mortality. In this case the most concerning feature of the meta-analyses is the risk for publication bias.

☒ D) Limiting the analysis to published medical literature introduces bias

☐ E) Randomized trials should not be used in a meta-analysis

Correct Answer: D.

Limiting the analysis to published medical literature increases the potential for publication bias in the meta-analysis. Publication bias favors studies that show statistically significant results or outcomes and leads to a higher publication rate of successful therapies compared to unsuccessful therapies. In this case, there may be other variables that account for the differences in published results for treatment A versus treatment B. For example, one treatment may have had a larger trial prior to medication approval, have been approved for a longer period, or have more follow-up data following treatment approval. Statistical measures to analyze the risk for publication bias are recommended as part of a meta-analysis, which are not presented in the vignette.

Incorrect Answers: A, B, C, and E.

Data cannot be combined from different studies (Choice A) is incorrect. Meta-analyses aggregate large sums of data to investigate a clinical outcome or result, compared to other treatments. Meta-analyses are clinically useful, especially when they compare the efficacy of one treatment versus alternatives.

Hip fracture is an unreliable outcome measure (Choice B) is incorrect. Hip fracture represents a poor outcome in patients with osteoporosis, which is associated with a high morbidity and mortality. In this case the most concerning feature of the meta-analyses is the risk for publication bias.

It is unethical to include patients in this type of study without their consent (Choice C) is incorrect. Meta-analyses aggregate unidentifiable data from multiple studies, increasing the size of the treatment population, and thereby increasing the power of the study. In this case, there is no risk to unidentifiable patients and therefore consent is not required.

Randomized trials should not be used in a meta-analysis (Choice E) is incorrect. Randomized control trials represent the gold standard for investigating clinical outcomes. In this case, the most concerning feature of the meta-analysis is the risk for publication bias.

Educational Objective: Meta-analyses aggregate data from multiple studies to investigate various treatments and clinical outcomes. Randomized control trials represent the gold standard for studies included in a meta-analysis. Publication bias favors studies with statistically significant clinical outcomes in the literature. In meta-analyses, statistical measures can be used and are recommended to investigate the potential for publication bias.



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23. Six hours after admission to the hospital for treatment of a pelvic fracture sustained in a motor vehicle collision, a 22-year-old man has bleeding from all intravenous and arterial catheter sites. On arrival, he had hypotension; he has required transfusion of 15 units of packed red blood cells and administration of 8 L of crystalloid solution since admission. His pulse is 100/min, respirations are 16/min, and blood pressure is 100/60 mm Hg. Examination shows a mildly distended abdomen. Which of the following is the most likely cause of this patient's coagulopathy?

- ☒ A) Factor V deficiency
- ☐ B) Hemolytic transfusion reaction
- ☐ C) Hemophilia A
- ☐ D) Thrombocytopenia
- ☐ E) von Willebrand disease

Correct Answer: D.

Platelets function in primary hemostasis by binding to injured endothelium directly and via interactions with von Willebrand factor (vWF). Following activation, they recruit additional platelets through the release of α - and δ -granules. The binding of fibrinogen to GpIIb/IIIa receptors on the surface of activated platelets functions to recruit and tether other platelets to form a mature platelet plug. This process occurs in conjunction with the coagulation cascade that ends with the formation of a fibrin superstructure. Patients with deficient platelets tend to develop spontaneous mucocutaneous bleeding, which can manifest as bleeding gums, petechiae, or purpura. Thrombocytopenia can develop as a result of myriad pathologic processes including drug reactions, viral infections, conditions associated with primary bone marrow failure, and autoimmune processes. In this case, the patient received a large volume of packed red blood cells and crystalloid solution, both of which do not contain platelets. The most likely cause of this patient's coagulopathy is dilutional thrombocytopenia.

Incorrect Answers: A, B, C, and E.

Factor V deficiency (Choice A) is an inherited condition that predisposes to venous thromboembolism and is caused by a point mutation in the F5 gene of factor V (proaccelerin). Factor V augments the action of thrombin and is normally inactivated by protein C. This mutation renders factor V resistant to inactivation from protein C, thereby promoting thrombosis.



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Correct Answer: D.

Platelets function in primary hemostasis by binding to injured endothelium directly and via interactions with von Willebrand factor (vWF). Following activation, they recruit additional platelets through the release of α - and δ -granules. The binding of fibrinogen to GpIIb/IIIa receptors on the surface of activated platelets functions to recruit and tether other platelets to form a mature platelet plug. This process occurs in conjunction with the coagulation cascade that ends with the formation of a fibrin superstructure. Patients with deficient platelets tend to develop spontaneous mucocutaneous bleeding, which can manifest as bleeding gums, petechiae, or purpura. Thrombocytopenia can develop as a result of myriad pathologic processes including drug reactions, viral infections, conditions associated with primary bone marrow failure, and autoimmune processes. In this case, the patient received a large volume of packed red blood cells and crystalloid solution, both of which do not contain platelets. The most likely cause of this patient's coagulopathy is dilutional thrombocytopenia.

Incorrect Answers: A, B, C, and E.

Factor V deficiency (Choice A) is an inherited condition that predisposes to venous thromboembolism and is caused by a point mutation in the F5 gene of factor V (proaccelerin). Factor V augments the action of thrombin and is normally inactivated by protein C. This mutation renders factor V resistant to inactivation from protein C, thereby promoting thrombosis.

Hemolytic transfusion reaction (Choice B) is common and can range in severity from mild discomfort to life-threatening illness. However, the most likely cause of this patient's coagulopathy is dilutional thrombocytopenia.

Hemophilia A (Choice C) is an X-linked coagulopathy caused by a genetic deficiency in factor VIII (antihemophilic factor) synthesis or activity. Patients often present with easy bruising and hemorrhage involving muscles and joints.

von Willebrand disease (Choice E) is a commonly inherited cause of mucocutaneous bleeding and results from a deficiency in vWF concentrations or function. It is reflected by increased INR, decreased factor VIII activity, and suppressed ristocetin cofactor activity. In this case, the patient has developed an acute coagulopathy after large volume resuscitation without platelet products, which makes dilutional thrombocytopenia more likely.

Educational Objective: Patients with thrombocytopenia may develop spontaneous mucocutaneous bleeding, which can manifest as bleeding gums, petechiae, or purpura. In cases of trauma with large volume resuscitation, it is important to provide platelets in addition to blood products and crystalloid solution. Otherwise, thrombocytopenia secondary to dilution may occur.



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- ✓ 24. An 87-year-old man with mild dementia is brought to the emergency department by his daughter after he fell down a flight of stairs. He has been seen in the emergency department because of three similar incidents during the past year. On arrival, he is oriented to person and place but not to time. His daughter remains at the bedside during the entire examination and answers most of the physician's questions. Examination shows multiple ecchymoses over the trunk and upper extremities. Results of laboratory studies are within the reference ranges. X-rays of the chest and spine show no abnormalities. Prior to discharge, the physician asks the patient about home safety, and the daughter becomes belligerent. She says she will never return to this emergency department again, saying "You do not know how to care for elderly patients." Which of the following is the most appropriate next step to ensure the safety of this patient?
- ☐ A) Confront the daughter with suspicion of physical abuse
 - ☒ B) Contact adult protective services
 - ☐ C) Have hospital security detain the daughter and discharge the patient to home
 - ☐ D) Have the case manager arrange for the patient to be transferred to a long-term care facility
 - ☐ E) Inform the daughter that the x-rays showed multiple fractures and the patient needs further monitoring

Correct Answer: B.

This patient has multiple physical injuries consistent with abuse. His caregiver's defensive response to questions about home safety also increases suspicion for abuse. Physicians should ask direct, open-ended questions of the patient alone about physical examination findings indicative of abuse. However, when elder abuse is suspected, the physician is legally mandated to report the suspected abuse to adult protective services regardless of the patient's response. Elder neglect and exploitation are also reportable offenses. Signs of abuse, neglect, and exploitation include multiple bruises, malnutrition, poor personal hygiene, sudden behavioral changes such as becoming less social, unsanitary living conditions, sudden changes in a patient's assets or living will, and caregivers refusing to let the patient be seen alone. Adult protective services investigates suspected abuse and coordinates appropriate interventions to ensure the safety of patients older than 60 years. As well, if a patient does not have a safe disposition, they should be admitted to the hospital for alternative disposition planning while adult protective services conducts an investigation.

Incorrect Answers: A, C, D, and E.

Confront the daughter with suspicion of physical abuse (Choice A) and inform the daughter that the x-rays showed multiple fractures and the patient needs further



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- ☐ D) Have the case manager arrange for the patient to be transferred to a long-term care facility
- ☐ E) Inform the daughter that the x-rays showed multiple fractures and the patient needs further monitoring

Correct Answer: B.

This patient has multiple physical injuries consistent with abuse. His caregiver's defensive response to questions about home safety also increases suspicion for abuse. Physicians should ask direct, open-ended questions of the patient alone about physical examination findings indicative of abuse. However, when elder abuse is suspected, the physician is legally mandated to report the suspected abuse to adult protective services regardless of the patient's response. Elder neglect and exploitation are also reportable offenses. Signs of abuse, neglect, and exploitation include multiple bruises, malnutrition, poor personal hygiene, sudden behavioral changes such as becoming less social, unsanitary living conditions, sudden changes in a patient's assets or living will, and caregivers refusing to let the patient be seen alone. Adult protective services investigates suspected abuse and coordinates appropriate interventions to ensure the safety of patients older than 60 years. As well, if a patient does not have a safe disposition, they should be admitted to the hospital for alternative disposition planning while adult protective services conducts an investigation.

Incorrect Answers: A, C, D, and E.

Confront the daughter with suspicion of physical abuse (Choice A) and inform the daughter that the x-rays showed multiple fractures and the patient needs further monitoring (Choice E) are unlikely to be productive, especially since the daughter reacted defensively during indirect confrontation of home safety concerns. The physician's first priority should be keeping this patient safe by reporting elder abuse to adult protective services. Also, informing the daughter that the x-rays showed multiple fractures would be dishonest and therefore unethical.

Have hospital security detain the daughter and discharge the patient to home (Choice C) is not indicated or safe. Adult protective services will investigate suspected abuse and involve law enforcement if needed. Discharging the patient home is likely to be unsafe given the patient's cognitive impairment and apparent need for a caregiver.

Have the case manager arrange for the patient to be transferred to a long-term care facility (Choice D) may be needed pending the results of the adult protective services investigation if there is no other relative suited to care for the patient. However, the first step is involving adult protective services to investigate the suspected abuse.

Educational Objective: Physicians are legally mandated to report suspected abuse, neglect, or exploitation of older patients. Adult protective services investigates suspected abuse and coordinates appropriate interventions to ensure older patients' safety.



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✓ 25. A 54-year-old woman with primary biliary cholangitis comes to the emergency department because of a 1-hour history of vomiting blood. Her medications are ursodiol, furosemide, spironolactone, and propranolol. She is awake and fully oriented. Her pulse is 80/min, and blood pressure is 100/60 mm Hg. Cardiopulmonary examination shows no abnormalities. The abdomen is soft and distended with ascites. There is mild edema of the lower extremities. Laboratory studies show:

Hemoglobin	6 g/dL
Platelet count	45,000/mm ³
Prothrombin time	22 sec (INR=2.3)
Serum total bilirubin	4 mg/dL

In addition to administration of intravenous fluids, which of the following is the most appropriate next step in management?

- ☐ A) Angiography
- ☐ B) Endoscopic retrograde cholangiopancreatography
- ☒ C) Esophagogastroduodenoscopy
- ☐ D) Intravenous antibiotic therapy
- ☐ E) Radiolabeled erythrocyte scan

Correct Answer: C.

This patient presents with signs of gastrointestinal bleeding likely from esophageal or gastric varices and requires an emergent esophagogastroduodenoscopy (EGD) to localize and treat the source of bleeding. Her history of primary biliary cholangitis, the presence of ascites, and laboratory findings of anemia, thrombocytopenia, and coagulopathy are all consistent with cirrhosis, with resultant portal hypertension and impaired hemostasis. EGD involves the use of an endoscope to evaluate the esophagus, stomach, and duodenum for structural abnormalities. EGD permits clipping, banding, cautery, or sclerotherapy of culprit lesions. In this case, the patient may have varices, ulcers, or arteriovenous malformations that may cause rapid and life-threatening exsanguination that need to be identified and treated. Additionally, coagulopathy should be reversed and blood transfused to temporize and halt any further blood loss.

☐ E) Radiolabeled erythrocyte scan

Correct Answer: C.

This patient presents with signs of gastrointestinal bleeding likely from esophageal or gastric varices and requires an emergent esophagogastroduodenoscopy (EGD) to localize and treat the source of bleeding. Her history of primary biliary cholangitis, the presence of ascites, and laboratory findings of anemia, thrombocytopenia, and coagulopathy are all consistent with cirrhosis, with resultant portal hypertension and impaired hemostasis. EGD involves the use of an endoscope to evaluate the esophagus, stomach, and duodenum for structural abnormalities. EGD permits clipping, banding, cautery, or sclerotherapy of culprit lesions. In this case, the patient may have varices, ulcers, or arteriovenous malformations that may cause rapid and life-threatening exsanguination that need to be identified and treated. Additionally, coagulopathy should be reversed, and blood transfused to temporize and halt any further blood loss.

Incorrect Answers: A, B, D, and E.

Angiography (Choice A) involves the injection of contrast dye into blood vessels and then obtaining radiographic images of those vessels. Visualizing the vessels allows the physician to determine if active bleeding is occurring, or if a vessel lumen is occluded by thrombus, stenosis, or dissection. Similarly, radiolabeled erythrocyte scan (Choice E) involves transfusing the patient with tagged red blood cells. Any cells that escape an injured vessel would then be visualized on a nuclear scan. This is a time-consuming test that offers diagnostic but not therapeutic means. Both examinations are less useful in the evaluation of an upper gastrointestinal tract bleed, making EGD the preferred method for evaluation and potential treatment.

Endoscopic retrograde cholangiopancreatography (ERCP) (Choice B) involves injection of radio-opaque dye into the biliary tree via the ampulla of Vater. This permits visualization of the structure of the biliary tree; masses, gallstones, or other obstructing lesions can be identified in this manner, and obstruction cleared by stenting or decompressive procedures. ERCP would be appropriate in cases of suspected choledocholithiasis, or in the diagnosis and treatment of known or unexplained biliary obstruction. It does not have a role in the management of brisk upper gastrointestinal bleeding.

Intravenous antibiotic therapy (Choice D) is appropriate in the management of this case, as gastrointestinal bleeding in the setting of ascites/cirrhosis presents a high risk for infection. However, this is not as important as hemorrhage control, which will be near-immediately fatal if not resolved promptly.

Educational Objective: Brisk gastrointestinal bleeding needs to be emergently managed to prevent life-threatening exsanguination. In cases of suspected or known varices, emergent esophagogastroduodenoscopy should occur to localize and treat the source of bleeding. Any existing coagulopathy should be reversed.



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- ✓ 26. An 84-year-old woman is brought to the physician because of a 6-week history of severely painful, nonhealing ulcers on both legs. During this time, the ulcers have progressively increased in size and number. She has rheumatoid arthritis treated with methotrexate. Her temperature is 37°C (98.6°F), pulse is 72/min and regular, and blood pressure is 120/80 mm Hg. Examination shows mild erythema and pale, full-thickness, punctate ulcers over the lower extremities. Cardiopulmonary examination shows no abnormalities. Which of the following is the most appropriate next step in management?
- ☐ A) Application of silver sulfadiazine to the ulcers
 - ☐ B) Excision and primary closure of the ulcers
 - ☐ C) Intravenous administration of cefazolin
 - ☐ D) Intravenous administration of hydrocortisone
 - ☒ E) Punch biopsy of an ulcer

Correct Answer: E.

Lower extremity ulcers are a common occurrence that may be caused by a variety of underlying conditions, including venous or arterial insufficiency, neuropathy, physical injury, vasculitis, insect bites, or malignancy. In this case, the patient has a known history of rheumatoid arthritis, which can be a cause of lower extremity ulcers. In the absence of findings indicating a clear diagnosis, a punch biopsy may be useful. Histologic examination of the tissue may assist in the diagnosis of conditions such as malignancy, vasculitis, infection, and microvascular occlusion.

Incorrect Answers: A, B, C, and D.

Application of silver sulfadiazine to the ulcers (Choice A) may be performed as silver sulfadiazine is a topical antiseptic agent. However, obtaining a punch biopsy of the ulcer would be the most appropriate next step in management to better identify the course of treatment.

Excision and primary closure of the ulcers (Choice B) is not the most appropriate next step in management. This patient has a history of progressive ulcers without a clearly identified cause. A punch biopsy would be a more appropriate next step in management.

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Correct Answer: E.

Lower extremity ulcers are a common occurrence that may be caused by a variety of underlying conditions, including venous or arterial insufficiency, neuropathy, physical injury, vasculitis, insect bites, or malignancy. In this case, the patient has a known history of rheumatoid arthritis, which can be a cause of lower extremity ulcers. In the absence of findings indicating a clear diagnosis, a punch biopsy may be useful. Histologic examination of the tissue may assist in the diagnosis of conditions such as malignancy, vasculitis, infection, and microvascular occlusion.

Incorrect Answers: A, B, C, and D.

Application of silver sulfadiazine to the ulcers (Choice A) may be performed as silver sulfadiazine is a topical antiseptic agent. However, obtaining a punch biopsy of the ulcer would be the most appropriate next step in management to better identify the course of treatment.

Excision and primary closure of the ulcers (Choice B) is not the most appropriate next step in management. This patient has a history of progressive ulcers without a clearly identified cause. A punch biopsy would be a more appropriate next step in management.

Intravenous administration of cefazolin (Choice C) may be a reasonable management option if there is concern for infection. Although the ulcers have mild erythema, this patient is afebrile and does not show other worrisome signs for infection.

Intravenous administration of hydrocortisone (Choice D) is not the most appropriate next step in management. Further workup to identify the possible cause of the progressive ulcers with a punch biopsy would be more appropriate. Corticosteroids are immunosuppressive and may be indicated in certain pathology of ulcers (eg, rheumatologic disease or vasculitis) and contraindicated in other causes (eg, infection, vascular occlusion).

Educational Objective: Lower extremity ulcers are a common condition that may be caused by conditions such as vasculitis, neuropathy, venous or arterial insufficiency, malignancy, or insect bites. When the diagnosis is unclear, a punch biopsy may be useful in identifying the underlying cause.



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- ✓ 27. An 84-year-old woman comes to the physician for a routine examination. She says she feels well. She has type 2 diabetes mellitus well controlled with metformin. Vital signs are within normal limits. Physical examination, including examination of the neck, shows no masses or abnormalities. Her serum calcium concentration is 11.4 mg/dL; repeat measurement 2 weeks later is 11.3 mg/dL. Which of the following is the most appropriate next step in diagnosis?

- ☒ A) Measurement of serum intact parathyroid hormone concentration
- ☐ B) Measurement of serum ionized calcium concentration
- ☐ C) Operative exploration of the neck
- ☐ D) Technetium 99m scan of the neck
- ☐ E) Ultrasonography of the neck

Correct Answer: A.

Measurement of serum intact parathyroid hormone (PTH) concentration is the most appropriate next step to confirm the diagnosis in this patient presenting with hypercalcemia. Hyperparathyroidism results in hypercalcemia, with clinical manifestations that include recurrent nephrolithiasis, bone pain from osseous resorption (osteitis fibrosa cystica), polyuria, dehydration, constipation, and psychiatric disturbances, along with hypophosphatemia, subperiosteal bone resorption, and renal failure. Hyperparathyroidism may be primary from a PTH-secreting source or secondary from increased stimulation of PTH production. Primary hyperparathyroidism is commonly caused by a parathyroid adenoma, but it can also be caused by parathyroid hyperplasia and parathyroid carcinoma. Excessive production of PTH results in increased serum calcium from increased osteoclast activity, intestinal absorption, and renal tubular absorption. Serum phosphorus concentration is decreased secondary to increased excretion by the renal tubules.

Incorrect Answers: B, C, D, and E.

Measurement of serum ionized calcium concentration (Choice B) would be unnecessary in this patient. Given that two increased measurements were obtained 2 weeks apart, it is reasonable to assume the results are accurate. Because of this, it is more important to begin working to find the cause of the elevation, rather than confirm the concentrations again.

Operative exploration of the neck (Choice C) is not appropriate. While some patients with parathyroid disease undergo this procedure, it is not the first step in diagnosis.



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Correct Answer: A.

Measurement of serum intact parathyroid hormone (PTH) concentration is the most appropriate next step to confirm the diagnosis in this patient presenting with hypercalcemia. Hyperparathyroidism results in hypercalcemia, with clinical manifestations that include recurrent nephrolithiasis, bone pain from osseous resorption (osteitis fibrosa cystica), polyuria, dehydration, constipation, and psychiatric disturbances, along with hypophosphatemia, subperiosteal bone resorption, and renal failure. Hyperparathyroidism may be primary from a PTH-secreting source or secondary from increased stimulation of PTH production. Primary hyperparathyroidism is commonly caused by a parathyroid adenoma, but it can also be caused by parathyroid hyperplasia and parathyroid carcinoma. Excessive production of PTH results in increased serum calcium from increased osteoclast activity, intestinal absorption, and renal tubular absorption. Serum phosphorus concentration is decreased secondary to increased excretion by the renal tubules.

Incorrect Answers: B, C, D, and E.

Measurement of serum ionized calcium concentration (Choice B) would be unnecessary in this patient. Given that two increased measurements were obtained 2 weeks apart, it is reasonable to assume the results are accurate. Because of this, it is more important to begin working to find the cause of the elevation, rather than confirm the concentrations again.

Operative exploration of the neck (Choice C) is not appropriate. While some patients with parathyroid tumors, whether benign or malignant, may need surgical intervention, this patient has not yet had sufficient workup to determine a diagnosis.

Technetium 99m scan of the neck (Choice D) is not appropriate. Technetium 99m sestamibi scans are used for the identification of parathyroid adenomas in the setting of primary hyperparathyroidism. The best initial step to confirm the diagnosis is to measure serum parathyroid hormone to first confirm primary hyperparathyroidism.

Ultrasonography of the neck (Choice E) is unnecessary in this patient. Ultrasonography of the neck can be helpful to identify both thyroid nodules and parathyroid masses, but the patient should initially be evaluated with serum PTH concentrations to first confirm the diagnosis of primary hyperparathyroidism.

Educational Objective: Hyperparathyroidism is a common endocrine disorder. Clinical manifestations are the result of hypercalcemia and include recurrent nephrolithiasis, bone pain, polyuria, volume depletion, constipation, and psychiatric disturbances. However, mild cases can be asymptomatic. Measurement of serum intact parathyroid hormone (PTH) concentration is the next best step to confirm the diagnosis in patients presenting with hypercalcemia.



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28. A 68-year-old man with chronic obstructive pulmonary disease is brought to the emergency department by his wife because of a 1-day history of severe shortness of breath and nonproductive cough. His wife reports that her husband has had increasing confusion and lethargy during this time. She says he also has had a 3-day history of fever and cough and a 1-day history of chills. On arrival, the patient is somnolent and difficult to arouse. He appears acutely ill. His temperature is 38.1°C (100.6°F), pulse is 110/min, respirations are 18/min, and blood pressure is 95/50 mm Hg. Pulse oximetry on 2 L/min of oxygen shows an oxygen saturation of 91%. He is using accessory muscles of respiration. Crackles are heard at the right lung base; there are scattered wheezes bilaterally. On cardiac examination, S₁ and S₂ are normal. The abdomen is soft. On mental status examination, he is drowsy and oriented to person but not to place or time. Laboratory studies show:

Leukocyte count	16,400/mm ³
Serum	
Na ⁺	143 mEq/L
K ⁺	3.6 mEq/L
Cl ⁻	105 mEq/L
HCO ₃ ⁻	12 mEq/L
Urea nitrogen	37 mg/dL
Creatinine	1.4 mg/dL

Arterial blood gas analysis on 2 L/min of oxygen by nasal cannula shows:

pH	7.04
Pco ₂	36 mm Hg
Po ₂	59 mm Hg

The patient is intubated and mechanically ventilated, and intravenous administration of fluids is begun. Which of the following is the most likely cause of the arterial blood gas findings?

- ☐ A) Metabolic acidosis only

- ☐ A) Metabolic acidosis only
- ☒ B) Metabolic acidosis with respiratory acidosis
- ☐ C) Metabolic acidosis with respiratory alkalosis
- ☐ D) Metabolic alkalosis only
- ☐ E) Metabolic alkalosis with respiratory acidosis
- ☐ F) Metabolic alkalosis with respiratory alkalosis
- ☐ G) Respiratory acidosis only
- ☐ H) Respiratory alkalosis only

Correct Answer: B.

This patient with a history of chronic obstructive pulmonary disease is presenting with symptoms that are suggestive of severe sepsis and respiratory failure. On examination, the patient appears acutely ill, has a fever, has tachycardia, and is nearly hypotensive. Even with supplemental oxygenation, the patient's oxygen saturation is still at 91% and he is utilizing accessory muscles of respiration. Initial laboratory studies are notable for leukocytosis and multiple metabolic derangements including low bicarbonate, high anion gap, and increased creatinine. Arterial blood gas analysis shows acidosis, with a normal PCO_2 . Under normal physiologic circumstances, patients with metabolic acidosis will undergo respiratory compensation, generally in the form of tachypnea, and will present with a low PCO_2 . The appropriate level of respiratory compensation can be determined using Winter's formula which states $compensated\ CO_2 = (HCO_3^- \times 1.5) + 8 \pm 2$. According to Winter's formula, the patient's compensated CO_2 concentration should be 21 to 25 mm Hg. Given that this patient's CO_2 is 36 mm Hg and respiratory rate is 18/min, he is not appropriately compensating for metabolic acidosis and has concomitant respiratory acidosis as the result of respiratory failure and central nervous system depression.

Incorrect Answers: A, C, D, E, F, G, and H.

Metabolic acidosis only (Choice A) is not correct. If this patient had a PCO_2 of 21 to 25 mm Hg, which would show appropriate respiratory compensation, then this answer would be correct. However, this patient has respiratory failure and is no longer compensated.

- ✓ 29. A 21-year-old man comes to the emergency department because of a 3-day history of moderate, diffuse abdominal pain and constipation. During this time, he also has had episodes of nausea and bilious vomiting. He has not had fever, chills, cold intolerance, or skin or hair changes. One year ago, he sustained a pelvic fracture during a motor vehicle collision. His only medication is daily oxycodone; he says he had to double his dose 1 week ago because of worsening pain. He appears uncomfortable. Vital signs are within normal limits. Abdominal examination shows diffuse tenderness to palpation with no rebound or guarding; bowel sounds are decreased. Rectal examination shows normal sphincter tone and brown stool in the vault. Which of the following is the most likely diagnosis?

- ☒ A) Drug-induced constipation
- ☐ B) Hypothyroidism
- ☐ C) Midgut volvulus
- ☐ D) Pudendal nerve injury
- ☐ E) Small-bowel obstruction

Correct Answer: A.

Oral administration of nonopioid medications may be helpful for pain control, but many patients may require opioid analgesics to control pain. Typically, the approach to adequately controlling pain is multimodal. Adjunctive pain medications including acetaminophen, NSAIDs, gabapentin, and others can help decrease the use of opioid medications and decrease the risk for adverse effects, tolerance, and dependence. While opioid medications can offer strong pain relief, opioids are central nervous system depressants and can lead to dependence, addiction, and death. In addition, opioids act on receptors within the gastrointestinal tract, reducing gut motility, and can cause constipation. This patient's increase in use of opioids during the past week likely is causing acute severe constipation and ileus. Oral cathartics (eg, magnesium citrate) and stool softeners (eg, docusate) should be initiated to assist the patient in defecation. Severe ileus may also require nasogastric (NG) tube insertion and bowel rest.

Incorrect Answers: B, C, D, and E.

Hypothyroidism (Choice B) presents with weight gain, fatigue, constipation, and cold intolerance. Physical examination typically shows bradycardia, dry, edematous skin, and delayed relaxation of deep tendon reflexes. This patient does not have any additional signs to suggest hypothyroidism.



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Correct Answer: A.

Oral administration of nonopioid medications may be helpful for pain control, but many patients may require opioid analgesics to control pain. Typically, the approach to adequately controlling pain is multimodal. Adjunctive pain medications including acetaminophen, NSAIDs, gabapentin, and others can help decrease the use of opioid medications and decrease the risk for adverse effects, tolerance, and dependence. While opioid medications can offer strong pain relief, opioids are central nervous system depressants and can lead to dependence, addiction, and death. In addition, opioids act on receptors within the gastrointestinal tract, reducing gut motility, and can cause constipation. This patient's increase in use of opioids during the past week likely is causing acute severe constipation and ileus. Oral cathartics (eg, magnesium citrate) and stool softeners (eg, docusate) should be initiated to assist the patient in defecation. Severe ileus may also require nasogastric (NG) tube insertion and bowel rest.

Incorrect Answers: B, C, D, and E.

Hypothyroidism (Choice B) presents with weight gain, fatigue, constipation, and cold intolerance. Physical examination typically shows bradycardia, dry, edematous skin, and delayed relaxation of deep tendon reflexes. This patient does not have any additional signs to suggest hypothyroidism.

Volvulus occurs when a portion of the gastrointestinal tract twists, leading to bowel obstruction. Midgut volvulus (Choice C) usually occurs in children who have intestinal malrotation, a congenital anomaly in which the midgut incompletely rotates during development, and typically presents within the first year of life.

The pudendal nerve (Choice D) provides somatic sensory and motor innervation to the genitals and the pelvic floor musculature. Injury to this nerve can occur with pelvic trauma or chronic compression and can cause disruption involving the complex interactions between sympathetic and parasympathetic nerves that provide autonomic control over urination, ejaculation, and defecation. While this patient has a remote history of pelvic trauma, the most likely cause of acute constipation is his recent increase in oxycodone use.

Small-bowel obstruction (Choice E) can present with abdominal pain, nausea, vomiting, and obstipation. Management requires bowel rest, insertion of an NG tube for decompression, and intravenous hydration followed by surgical intervention if the obstruction does not autoreduce. While this patient's prior abdominal surgery puts him at risk for small-bowel obstruction, small-bowel obstruction typically presents more acutely and with abdominal distension. This patient's increase in oxycodone use is the most likely cause of constipation.

Educational Objective: A common adverse effect of opioid medication use is constipation caused by opioid-associated bowel hypomotility. Oral cathartics (eg, magnesium citrate) and stool softeners (eg, docusate) should be initiated to assist the patient in defecation. Severe ileus may also require nasogastric tube insertion and bowel rest.



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30. A 5-month-old male infant is brought to the physician because of chronic respiratory congestion since birth. Perinatal history showed no abnormalities. Since birth, he has had two episodes of pneumonia, one requiring hospitalization. He has a tendency to cough and choke during feedings with liquids. He is at the 50th percentile for length and the 5th percentile for weight. Examination shows mild persistent intercostal retractions. Scattered wheezes and some crackles are heard on auscultation. Which of the following imaging studies is most likely to confirm the diagnosis?

- ☒ A) Barium swallow
- ☐ B) CT scan of the head
- ☐ C) Fluoroscopy of the chest
- ☐ D) Lateral x-ray of the neck
- ☐ E) Ultrasonography of the thorax

Correct Answer: A.

Patients presenting with recurrent pneumonia should be evaluated for a variety of potential causes such as anatomic congenital abnormalities and immunosuppressive processes. This infant presents with persistent respiratory congestion and a history of coughing and choking during feedings with liquids. This raises concern for an underlying anatomic abnormality resulting in the patient's inability to appropriately swallow contents. Tracheoesophageal fistula (TEF) refers to the presence of a fistulous connection between the esophagus and trachea. There are a variety of types of TEF, with and without the concomitant presence of esophageal atresia. The initial step in diagnosing a TEF is a barium swallow, which will help outline the patient's specific anatomy. Definitive management requires surgical repair. Additional screening for associated congenital malformations should occur, as TEF and esophageal atresia are associated with the VACTERL group of malformations and CHARGE syndrome.

Incorrect Answers: B, C, D, and E.

CT scan of the head (Choice B) is primarily used to screen for potential neurologic abnormalities to explain patient symptoms. This patient is presenting with recurrent respiratory issues, not neurologic issues. Therefore, a CT scan of the head would play little role in the workup of his underlying issue.

Fluoroscopy of the chest (Choice C) can assess for the presence of diaphragmatic paralysis through dynamic imaging of diaphragmatic excursion during breathing. This

- ☐ B) Lateral x-ray of the neck
- ☐ E) Ultrasonography of the thorax

Correct Answer: A.

Patients presenting with recurrent pneumonia should be evaluated for a variety of potential causes such as anatomic congenital abnormalities and immunosuppressive processes. This infant presents with persistent respiratory congestion and a history of coughing and choking during feedings with liquids. This raises concern for an underlying anatomic abnormality resulting in the patient's inability to appropriately swallow contents. Tracheoesophageal fistula (TEF) refers to the presence of a fistulous connection between the esophagus and trachea. There are a variety of types of TEF, with and without the concomitant presence of esophageal atresia. The initial step in diagnosing a TEF is a barium swallow, which will help outline the patient's specific anatomy. Definitive management requires surgical repair. Additional screening for associated congenital malformations should occur, as TEF and esophageal atresia are associated with the VACTERL group of malformations and CHARGE syndrome.

Incorrect Answers: B, C, D, and E.

CT scan of the head (Choice B) is primarily used to screen for potential neurologic abnormalities to explain patient symptoms. This patient is presenting with recurrent respiratory issues, not neurologic issues. Therefore, a CT scan of the head would play little role in the workup of his underlying issue.

Fluoroscopy of the chest (Choice C) can assess for the presence of diaphragmatic paralysis through dynamic imaging of diaphragmatic excursion during breathing. This patient has no apparent risk factors for diaphragmatic paralysis, which primarily occurs following cardiothoracic surgery and trauma.

Lateral x-ray of the neck (Choice D) can assist in the workup of potential retropharyngeal abscess and epiglottitis. While these two conditions are often diagnosed clinically, the presence of abnormal soft tissue morphology of these structures on a lateral neck x-ray can assist in the diagnosis.

Ultrasonography of the thorax (Choice E) is used primarily for the evaluation of underlying pulmonary and pleural processes in infants. It can be used to assess the presence of a pleural effusion, pneumothorax, and assist in differentiating pneumonia and atelectasis at a young age.

Educational Objective: Tracheoesophageal fistula (TEF) refers to the presence of a fistulous connection between the esophagus and trachea. The initial step in diagnosing a TEF is a barium swallow, which will help outline a patient's specific anatomy. Definitive management requires surgical repair. Additional screening for associated congenital malformations should occur, as TEF and esophageal atresia are associated with the VACTERL group of malformations and CHARGE syndrome.

31. A 72-year-old man comes to the emergency department because of a 4-month history of leg swelling and increasing abdominal girth. He also has a 2-year history of progressive shortness of breath. During the past 3 months, he has needed two pillows to breathe while sleeping. He has no history of serious illness and takes no medications. He has never smoked cigarettes. He worked as a sandblaster in a foundry for 40 years. His pulse is 110/min, respirations are 20/min, and blood pressure is 120/80 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 88%. Jugular venous pressure is 12 cm H₂O (N=5–9). Dry crackles are heard diffusely. Cardiac examination shows a normal S₁ and a split S₂ with a pronounced P₂; no murmurs are heard. Abdominal examination shows distention with bulging flanks. The liver is mildly tender; the span is 16 cm. There is 2+ pitting edema to the knee. A chest x-ray is shown. Which of the following is the most appropriate immediate step in management?

- ☒ A) Administration of oxygen
- ☐ B) Bronchoscopy
- ☐ C) Lung biopsy
- ☐ D) Pulmonary artery catheterization
- ☐ E) Ultrasonography-guided paracentesis

Correct Answer: A.

The patient's history and chest imaging findings are suggestive of silicosis. Silicosis is a type of pneumoconiosis that results from an inflammatory response stimulated by reaction to insoluble particulates. Silica exposure is a common occupational hazard, especially in construction, mining, demolition, sandblasting, ceramics, tunneling, and working in fields that produce large amounts of crystalline silica dust. Acute silicosis typically presents with rapidly progressive symptoms that include dyspnea on exertion, productive cough, and weight loss. Chronic silicosis develops over years. It may remain asymptomatic or present with the insidious onset of progressive dyspnea, productive cough, weight loss, and fatigue. Severe cases may result in pulmonary hypertension and cor pulmonale, as seen in this patient. Supportive care with oxygen therapy should be initiated in those with hypoxia. Diagnosis can be challenging and relies on a known history of silica exposure and characteristic chest imaging findings, which include bilateral ground glass opacities and numerous small, rounded opacities with an upper lobe predominance, along with eggshell calcifications in a perihilar distribution. Patients with silicosis are more susceptible to developing chronic obstructive pulmonary disease, especially in the setting of tobacco use.

The patient's history and chest imaging findings are suggestive of silicosis. Silicosis is a type of pneumoconiosis that results from an inflammatory response stimulated by reaction to insoluble particulates. Silica exposure is a common occupational hazard, especially in construction, mining, demolition, sandblasting, ceramics, tunneling, and working in fields that produce large amounts of crystalline silica dust. Acute silicosis typically presents with rapidly progressive symptoms that include dyspnea on exertion, productive cough, and weight loss. Chronic silicosis develops over years. It may remain asymptomatic or present with the insidious onset of progressive dyspnea, productive cough, weight loss, and fatigue. Severe cases may result in pulmonary hypertension and cor pulmonale, as seen in this patient. Supportive care with oxygen therapy should be initiated in those with hypoxia. Diagnosis can be challenging and relies on a known history of silica exposure and characteristic chest imaging findings, which include bilateral ground glass opacities and numerous small, rounded opacities with an upper lobe predominance, along with eggshell calcifications in a perihilar distribution. Patients with silicosis are more susceptible to developing chronic obstructive pulmonary disease, especially in the setting of tobacco use.

Incorrect Answers: B, C, D, and E.

Bronchoscopy (Choice B) is not needed in this patient. Bronchoscopy can offer insight into endobronchial pathologies; however, due to the nature of silicosis and the current presentation of cor pulmonale as a result, this would not offer valuable diagnostic information and would delay essential care.

Lung biopsy (Choice C) is not necessary or appropriate at this time. A lung biopsy can confirm the diagnosis of silicosis, if needed, but is not immediately warranted. Oxygen administration is more appropriate.

Pulmonary artery catheterization (Choice D) is not the best next step for this patient. While the patient shows signs and symptoms consistent with right-sided heart failure, which may ultimately warrant right heart catheterization, the most immediate step is to provide this hypoxic patient with supplemental oxygen.

Ultrasonography-guided paracentesis (Choice E) is not the best next step for this patient. His abdominal distention and leg swelling is due to cor pulmonale. While he may necessitate paracentesis in the future due to the ascites, this patient requires oxygen administration first.

Educational Objective: Silicosis is a form of occupational lung disease caused by exposure to inhaled silica dust. Patients typically present with dyspnea and productive cough, with characteristic perihilar and upper lobe predominant opacities on chest imaging. Supportive care with oxygen therapy should be initiated in those with hypoxia.



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32. A 3-year-old girl is brought to the physician by her mother because of a 5-day history of blood-tinged, foul smelling vaginal discharge. The patient reports moderate discomfort with wiping after urination. She does not have abdominal or pelvic pain or fever. She has no history of serious illness and receives no medications. Development is appropriate for age. The patient is at the 10th percentile for height and 50th percentile for weight. Her temperature is 37°C (98.6°F), pulse is 62/min, and blood pressure is 100/60 mm Hg. There is no inguinal lymphadenopathy. Abdominal examination shows no tenderness. Pelvic examination shows pink, crusty discharge over the vulva, and pink discharge at the vaginal introitus. There are no lesions or tears. The hymenal ring is annular without clefts. Which of the following is the most appropriate next step in management?

- ☐ A) Oral antibiotic therapy
- ☐ B) Oral antifungal therapy
- ☐ C) Sitz baths
- ☐ D) Topical corticosteroid therapy
- ☒ E) Vaginal irrigation

Correct Answer: E.

Vulvovaginitis presents with vaginal itching, erythema, and discharge, and can result from a variety of causes. When present in a prepubertal child, a careful investigation into the possibility of sexual abuse should occur. Other causes of vulvovaginitis in a pediatric patient include poor hygiene, foreign bodies (especially toilet paper), occlusive clothing, and exposure to irritants. Less common causes include infections such as pinworms, *Streptococcus pyogenes*, and *Escherichia coli*. Foreign bodies and infections are frequently associated with foul odor and vaginal discharge. This patient should undergo further pelvic examination to assess for the presence of a foreign body. If detected, the foreign body should be removed along with vaginal irrigation to decrease the amount of purulent material in the vaginal canal. This should be followed by antibiotic therapy.

Incorrect Answers: A, B, C, and D.

Oral antibiotic therapy (Choice A) should be administered to this patient with foreign body-related vulvovaginitis, but only after foreign body removal and vaginal irrigation. Antibiotic therapy alone would not adequately treat this patient's condition due to the likely presence of a foreign body.



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☒ E) Vaginal irrigation

Correct Answer: E.

Vulvovaginitis presents with vaginal itching, erythema, and discharge, and can result from a variety of causes. When present in a prepubertal child, a careful investigation into the possibility of sexual abuse should occur. Other causes of vulvovaginitis in a pediatric patient include poor hygiene, foreign bodies (especially toilet paper), occlusive clothing, and exposure to irritants. Less common causes include infections such as pinworms, *Streptococcus pyogenes*, and *Escherichia coli*. Foreign bodies and infections are frequently associated with foul odor and vaginal discharge. This patient should undergo further pelvic examination to assess for the presence of a foreign body. If detected, the foreign body should be removed along with vaginal irrigation to decrease the amount of purulent material in the vaginal canal. This should be followed by antibiotic therapy.

Incorrect Answers: A, B, C, and D.

Oral antibiotic therapy (Choice A) should be administered to this patient with foreign body-related vulvovaginitis, but only after foreign body removal and vaginal irrigation. Antibiotic therapy alone would not adequately treat this patient's condition due to the likely presence of a foreign body.

Oral antifungal therapy (Choice B) is not indicated in the setting of foreign body vulvovaginitis. Antifungal therapy would be indicated for vulvovaginal candidiasis, which typically presents with thick, white discharge.

Sitz baths (Choice C) are often used to assist in the treatment and symptom management of various perineal/perianal conditions. This includes conditions such as anal fissures, hemorrhoids, and following vaginal delivery or surgery involving the vagina or anus.

Topical corticosteroid therapy (Choice D) applied to the vagina may be used in the treatment of lichen planus or lichen sclerosis. This would not assist in the management of foreign body vulvovaginitis and may further worsen the degree of associated infection.

Educational Objective: Vulvovaginitis presents with vaginal itching, erythema, and discharge, and can result from a variety of causes. When present in a prepubertal child, a careful investigation into the possibility of sexual abuse should occur. Other causes of vulvovaginitis in a pediatric patient include poor hygiene, foreign bodies (especially toilet paper), occlusive clothing, and exposure to irritants. Foreign bodies are frequently associated with foul odor and vaginal discharge. If detected, a foreign body should be removed along with vaginal irrigation to decrease the amount of purulent material in the vaginal canal.



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- ✓ 33. A 6-week-old boy is brought to the physician for a well-child examination. He was born at term following an uncomplicated pregnancy and spontaneous vaginal delivery. He weighed 3175 g (7 lb) at birth. Apgar scores were 8 and 10 at 1 and 5 minutes, respectively. He is exclusively breast-fed. He is at the 90th percentile for length, 50th percentile for weight, and 60th percentile for head circumference. Examination shows diffuse jaundice. His serum total bilirubin concentration is 8.1 mg/dL, with a direct component of 5.2 mg/dL. Which of the following is the most appropriate next step in management?
- ☐ A) Exchange transfusion
 - ☐ B) Phototherapy
 - ☐ C) Switching from breast milk to cow milk-based formula
 - ☒ D) Ultrasonography of the abdomen
 - ☐ E) No further management is indicated

Correct Answer: D.

In congenital biliary atresia, the common bile duct is occluded and bile is unable to pass into the duodenum. This precludes the use of bile in the digestion of dietary fats and causes fat malabsorption. In contrast to benign causes of neonatal jaundice, biliary atresia presents with progressively worsening jaundice with conjugated or direct hyperbilirubinemia, pale stools, dark urine, poor weight gain, and, in untreated cases, cirrhosis, coagulopathy, and portal hypertension. Classically, benign causes of neonatal jaundice will improve by the second to third week of life, whereas biliary atresia will persist and often worsen within the first 8 weeks of life. This patient has a conjugated hyperbilirubinemia, which suggests a pathologic cause of jaundice such as biliary atresia. Diagnosis consists of history and physical examination, serum liver function testing, as well as ultrasonography of the abdomen, HIDA scan, or cholangiography, with definitive diagnosis occurring during exploratory surgery with visualization of atretic bile ducts. Treatment is through hepatoportoenterostomy (ie, Kasai procedure), which restores biliary flow, decreases jaundice, and helps salvage the native liver function. Liver transplant may be required if the procedure is unsuccessful.

Incorrect Answers: A, B, C, and E.

Exchange transfusion (Choice A) and phototherapy (Choice B) are treatment modalities for benign neonatal jaundice arising from unconjugated bilirubinemia. Benign neonatal hyperbilirubinemia, or physiologic jaundice, is caused by the increased breakdown of red blood cells and thus generation of bilirubin, the immature liver



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Correct Answer: D.

In congenital biliary atresia, the common bile duct is occluded and bile is unable to pass into the duodenum. This precludes the use of bile in the digestion of dietary fats and causes fat malabsorption. In contrast to benign causes of neonatal jaundice, biliary atresia presents with progressively worsening jaundice with conjugated or direct hyperbilirubinemia, pale stools, dark urine, poor weight gain, and, in untreated cases, cirrhosis, coagulopathy, and portal hypertension. Classically, benign causes of neonatal jaundice will improve by the second to third week of life, whereas biliary atresia will persist and often worsen within the first 8 weeks of life. This patient has a conjugated hyperbilirubinemia, which suggests a pathologic cause of jaundice such as biliary atresia. Diagnosis consists of history and physical examination, serum liver function testing, as well as ultrasonography of the abdomen, HIDA scan, or cholangiography, with definitive diagnosis occurring during exploratory surgery with visualization of atretic bile ducts. Treatment is through hepatoportoenterostomy (ie, Kasai procedure), which restores biliary flow, decreases jaundice, and helps salvage the native liver function. Liver transplant may be required if the procedure is unsuccessful.

Incorrect Answers: A, B, C, and E.

Exchange transfusion (Choice A) and phototherapy (Choice B) are treatment modalities for benign neonatal jaundice arising from unconjugated bilirubinemia. Benign neonatal hyperbilirubinemia, or physiologic jaundice, is caused by the increased breakdown of red blood cells and thus generation of bilirubin, the immature liver metabolism of bilirubin, and the increased enterohepatic circulation of bilirubin. Neonatal hyperbilirubinemia is closely monitored in order to prevent kernicterus, which refers to the deposition of bilirubin in the basal ganglia, pons, and cerebellum, which can occur at bilirubin concentrations of 25 to 30 mg/dL.

Switching from breast milk to cow milk-based formula (Choice C) is inappropriate for this patient who is within normal limits for height and weight measurements, indicating he is receiving adequate nutrition from breast milk. Conversion of an infant's diet to formula is reserved for infants who are not receiving adequate levels of nutrition from breast milk, typically in the setting of various possible breast-feeding difficulties such as a low milk supply from the mother or difficulty with breast-feeding latching by the infant.

No further management is indicated (Choice E) is inappropriate. Treatment for biliary atresia should begin as soon as possible to help salvage native liver function. If biliary atresia is left untreated, liver failure may result and liver transplant may be required.

Educational Objective: Congenital biliary atresia leads to conjugated hyperbilirubinemia and is diagnosed with a combination of serum liver function testing and abdominal imaging, such as with ultrasonography, HIDA scan, or cholangiography. Definitive diagnosis occurs during exploratory surgery with visualization of atretic bile ducts.

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- ✓ 34. An 8-year-old boy is brought to the physician for a well-child examination. At the age of 3 months, he underwent surgical repair of posterior urethral valves. Since that time, he has been treated for chronic kidney disease. He receives no medications. His pulse is 100/min, and blood pressure is 120/80 mm Hg. Examination shows no other abnormalities. Which of the following serum concentrations is most likely to be increased in this patient?

- ☒ A) Angiotensin
- ☐ B) Erythropoietin
- ☐ C) Glucose
- ☐ D) Growth factor
- ☐ E) Testosterone

Correct Answer: A.

Angiotensin concentrations are most likely to be increased in this pediatric patient with hypertension. Congenital urinary tract abnormalities include but are not limited to unilateral renal agenesis, fused kidneys, ureteral stricture and stenosis, duplex collecting system, posterior urethral valves, bladder agenesis, bladder exstrophy, hypo- or epispadias, and urethral strictures. Regardless of the cause of malformation, ureteral obstruction and vesicoureteral reflux are common complications. Chronic reflux can lead to compression atrophy of the renal parenchyma, pyelonephritis, scarring, and renal insufficiency or chronic kidney disease. Reduced renal blood flow results in activation of the renin-angiotensin-aldosterone system with resultant hypertension because of increases in renin, angiotensin, and aldosterone concentrations.

Incorrect Answers: B, C, D, and E.

Erythropoietin (Choice B) is generally decreased in patients with chronic kidney disease, such as this patient, due to the role of renal parenchyma in synthesis of this hormone.

Glucose (Choice C) is unlikely to be affected by chronic kidney disease unless diabetes or endocrinopathy is also present.

Growth factor (Choice D) refers to a broad class of hormones that stimulate cell growth, differentiation, and proliferation. They may be peptides or steroids. An example is



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35. A 38-year-old man comes to the physician because of a 10-month history of progressive shortness of breath, wheezing, and cough productive of clear sputum. He has not had fever, weight loss, or cough productive of bloody sputum. He has no history of serious illness and takes no medications. The patient has smoked one-half pack of cigarettes daily for 10 years. He does not appear to be in acute distress. His respirations are 16/min. Pulse oximetry on room air shows an oxygen saturation of 96%. Examination shows a barrel-shaped chest. Diffuse inspiratory crackles and expiratory wheezes are heard. Spirometry shows an FEV₁ of 50% of predicted and an FVC of 70% of predicted. A chest x-ray shows hyperlucency of the lung fields, a flattened diaphragm, and a large retrosternal air space. During his lifetime, this patient is at increased risk for which of the following?

- ☒ A) Cirrhosis
- ☐ B) Gastroesophageal reflux disease
- ☐ C) Nephrotic syndrome
- ☐ D) Pancreatic insufficiency
- ☐ E) Thymoma

Correct Answer: A.

This patient presents with chronic shortness of breath, wheezing, and cough. His examination shows a barrel-shaped chest, and pulmonary function tests disclose an obstructive pattern of lung disease. This presentation is consistent with chronic obstructive pulmonary disease, early in onset and, with a relatively mild smoking history, likely from underlying α_1 -antitrypsin deficiency. α_1 -Antitrypsin deficiency is an inherited disorder. Reduced concentrations of the protein result in host tissue damage from neutrophil elastase, especially in the lungs and liver. Pulmonary manifestations include early-onset panlobular emphysema, which results in the development of bullous air spaces predominantly in the lower lobes. Hepatic manifestations include chronic liver inflammation and cirrhosis due to the accumulation of misfolded α_1 -antitrypsin polymers in hepatocytes. The diagnosis should be suspected in patients presenting with evidence of early-onset lung disease with emphysematous changes and/or no history of tobacco use, or early-onset cirrhosis with no or minimal history of associated conditions (eg, alcohol use, hepatitis).

Incorrect Answers: B, C, D, and E.



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This patient presents with chronic shortness of breath, wheezing, and cough. His examination shows a barrel-shaped chest, and pulmonary function tests disclose an obstructive pattern of lung disease. This presentation is consistent with chronic obstructive pulmonary disease, early in onset and, with a relatively mild smoking history, likely from underlying α_1 -antitrypsin deficiency. α_1 -Antitrypsin deficiency is an inherited disorder. Reduced concentrations of the protein result in host tissue damage from neutrophil elastase, especially in the lungs and liver. Pulmonary manifestations include early-onset panlobular emphysema, which results in the development of bullous air spaces predominantly in the lower lobes. Hepatic manifestations include chronic liver inflammation and cirrhosis due to the accumulation of misfolded α_1 -antitrypsin polymers in hepatocytes. The diagnosis should be suspected in patients presenting with evidence of early-onset lung disease with emphysematous changes and/or no history of tobacco use, or early-onset cirrhosis with no or minimal history of associated conditions (eg, alcohol use, hepatitis).

Incorrect Answers: B, C, D, and E.

Gastroesophageal reflux disease (Choice B) presents with epigastric and substernal discomfort, generally described as burning, often following a meal containing trigger foods (eg, chocolate, tomatoes). It arises from incompetence of the lower esophageal sphincter and is not a known complication of α_1 -antitrypsin deficiency.

Nephrotic syndrome (Choice C) arises because of loss of normal size and charge filtration of the glomerular capillary and Bowman capsule interface. Causes of nephrotic syndrome include minimal change disease, membranous nephropathy, and focal segmental glomerular sclerosis. α_1 -Antitrypsin deficiency is not a known association with nephrotic syndrome.

Pancreatic insufficiency (Choice D) occurs in the setting of chronic pancreatitis, and results in insufficient pancreatic enzyme production and secretion. This leads to inadequate digestion of macromolecules and resultant malnutrition, presenting with diarrhea and steatorrhea. Chronic alcohol use is a common cause. It does not have a known association with α_1 -antitrypsin deficiency.

Thymoma (Choice E), a tumor of the thymus, is most associated with myasthenia gravis as a complication. It does not have a known association with α_1 -antitrypsin deficiency; however, patients with dermatomyositis, systemic lupus erythematosus, and Cushing syndrome appear to be at higher risk.

Educational Objective: α_1 -Antitrypsin deficiency should be suspected in young patients who present with bibasilar emphysematous lung changes in the absence of a smoking history. Patients are also at risk for chronic liver inflammation and cirrhosis due to the accumulation of misfolded α_1 -antitrypsin polymers in hepatocytes.



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✓ 36. A 73-year-old woman, who resides in a skilled nursing care facility, is brought to the emergency department by staff because of a 6-hour history of confusion. She has schizoaffective disorder treated with risperidone. The staff members say that she usually is alert and fully oriented. Her temperature is 39.4°C (103°F), pulse is 84/min, respirations are 16/min, and blood pressure is 116/78 mm Hg. Physical examination shows muscle rigidity in all the extremities. On mental status examination, she is minimally cooperative and moans incoherently. She is oriented to person but not to place or time. Serum studies show a creatine kinase concentration of 2000 U/L. Which of the following is the most appropriate next step in management?

- ☐ A) Benztropine therapy
- ☒ B) Discontinuation of risperidone
- ☐ C) Electroconvulsive therapy
- ☐ D) Hemodialysis
- ☐ E) Vitamin E supplementation

Correct Answer: B.

Neuroleptic malignant syndrome (NMS) is the most likely diagnosis in this patient who has received high-potency antipsychotic medication (risperidone). NMS is a life-threatening condition associated with the antagonism of dopamine that presents with altered mental status, muscle rigidity, hyperthermia, and autonomic dysfunction (eg, tachycardia, sweating). Common causative agents are antipsychotics (especially high-potency antipsychotics) and antidopaminergic nausea medications. Rigidity results from dopamine antagonism in the nigrostriatal pathway, while autonomic dysfunction and hyperthermia may result from dopamine antagonism in the hypothalamus. Characteristic laboratory abnormalities include leukocytosis and increased serum creatine kinase, lactate dehydrogenase, and alkaline phosphatase (due to prolonged muscle rigidity and consequent myocyte damage). Electrolyte abnormalities (eg, hypo- or hypernatremia, hypocalcemia) may also be shown. Treatment is supportive and includes discontinuation of the causative medication, hydration, cooling blankets, and benzodiazepines, if needed, for agitation.

Incorrect Answers: A, C, D, and E.

Benztropine (Choice A) is an anticholinergic medication that antagonizes muscarinic acetylcholine receptors in the central nervous system, modulating the dopamine-acetylcholine balance in the basal ganglia, and thus treats parkinsonism and acute dystonic reaction. Benztropine therapy is not used in NMS as it can suppress sweating.

☐ E) Vitamin E supplementation

Correct Answer: B.

Neuroleptic malignant syndrome (NMS) is the most likely diagnosis in this patient who has received high-potency antipsychotic medication (risperidone). NMS is a life-threatening condition associated with the antagonism of dopamine that presents with altered mental status, muscle rigidity, hyperthermia, and autonomic dysfunction (eg, tachycardia, sweating). Common causative agents are antipsychotics (especially high-potency antipsychotics) and antidopaminergic nausea medications. Rigidity results from dopamine antagonism in the nigrostriatal pathway, while autonomic dysfunction and hyperthermia may result from dopamine antagonism in the hypothalamus. Characteristic laboratory abnormalities include leukocytosis and increased serum creatine kinase, lactate dehydrogenase, and alkaline phosphatase (due to prolonged muscle rigidity and consequent myocyte damage). Electrolyte abnormalities (eg, hypo- or hypernatremia, hypocalcemia) may also be shown. Treatment is supportive and includes discontinuation of the causative medication, hydration, cooling blankets, and benzodiazepines, if needed, for agitation.

Incorrect Answers: A, C, D, and E.

Benztropine (Choice A) is an anticholinergic medication that antagonizes muscarinic acetylcholine receptors in the central nervous system, modulating the dopamine-acetylcholine balance in the basal ganglia, and thus treats parkinsonism and acute dystonic reaction. Benzotropine therapy is not used in NMS as it can suppress sweating and thereby prevent normalization of hyperthermia.

Electroconvulsive therapy (Choice C) is reserved for patients with NMS who do not respond to medication discontinuation and supportive therapy. Electroconvulsive therapy likely carries cardiovascular and seizure risk in patients with NMS.

Hemodialysis (Choice D) is not indicated in NMS. Further, risperidone concentrations are typically unchanged by hemodialysis.

Vitamin E supplementation (Choice E) is occasionally used to treat tardive dyskinesia secondary to antipsychotic medication. It has no role in acute NMS treatment.

Educational Objective: Neuroleptic malignant syndrome is a life-threatening condition associated with the antagonism of dopamine that presents with altered mental status, muscle rigidity, hyperthermia, and autonomic dysfunction. Common causative agents are antipsychotics (especially high-potency antipsychotics) and antidopaminergic nausea medications. Management involves discontinuation of the causative agent and supportive therapy.



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- ✓ 37. A 33-year-old primigravid woman at 19 weeks' gestation comes to the office for a routine prenatal visit. She feels well, and pregnancy has been uncomplicated. Ultrasonography 1 week ago showed a dichorionic-diamniotic intrauterine twin gestation. She has smoked one to two cigarettes weekly during pregnancy. Her pulse is 90/min, and blood pressure is 105/65 mm Hg. Fundal height is 22 cm. Twin A has a heart rate of 130/min, and twin B has a heart rate of 140/min. There is no lower extremity edema. Urine dipstick shows trace protein. This patient is at greatest risk for which of the following pregnancy complications?
- ☐ A) Abruptio placentae
 - ☐ B) Fetal demise
 - ☐ C) Fetal growth restriction
 - ☒ D) Preterm delivery
 - ☐ E) Twin-twin transfusion syndrome

Correct Answer: D.

Twin gestations occur due to the splitting of a fertilized ovum (monozygotic twins) or due to the fertilization of two ova by two sperm (dizygotic twins). Monozygotic twins are further classified based on their chorionicity and amnionicity, which are believed consequent to how early in development the zygote divides. Early division is believed to lead to dichorionic-diamniotic twins, intermediate division to monochorionic-diamniotic twins, and later division to monochorionic-monoamniotic twins. There is an increased risk for fetal complications in monoamniotic and monochorionic pregnancies. Monoamniotic pregnancies can be complicated by conjoined twins and umbilical cord entanglement, while monochorionic pregnancies can be complicated by twin-twin transfusion syndrome and selective fetal growth restriction. Twin gestations, in general, are more commonly associated with preeclampsia, preterm delivery, fetal growth restriction, and placental abnormalities, such as placenta previa. While this patient's dichorionic-diamniotic intrauterine twin gestation has less associated risks for the fetuses, there remains an increased risk for preterm delivery.

Incorrect Answers: A, B, C, and E.

Abruptio placentae (Choice A) is the premature separation of the placenta from the uterus. It commonly presents with vaginal bleeding, severe uterine pain, and tetanic contractions, typically in the third trimester. This patient does not have significant risk factors for the development of abruptio placentae.

Fetal demise (Choice B) refers to the death of a fetus after 20 weeks' gestation. Dichorionic-diamniotic twin gestations do not have an increased risk for fetal demise.



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✓ 38. A 56-year-old man comes to the office because of a 3-month history of an enlarging painful ulcer on his left ankle. The ulcer occasionally exudes a clear, yellow fluid. He has cleaned the ulcer daily with soap and lukewarm water and applied an over-the-counter topical antibiotic to the area, with minimal relief. He has not had fever or chills or sustained any recent trauma. He has type 2 diabetes mellitus, coronary artery disease, hypertension, and hyperlipidemia. His medications are metformin, glipizide, atorvastatin, enalapril, hydrochlorothiazide, metoprolol, isosorbide mononitrate, and aspirin. He has no known drug allergies. He smoked one and one-half packs of cigarettes daily for 33 years but quit 5 years ago. He is 180 cm (5 ft 11 in) tall and weighs 90 kg (198 lb); BMI is 28 kg/m². Vital signs are within normal limits. He does not appear to be in acute distress. A photograph of the left lower extremity is shown. Dorsalis pedis pulses are 2+ bilaterally; posterior tibial pulses cannot be palpated. Monofilament testing shows decreased sensation over the feet; proprioception is intact. Which of the following is the most likely diagnosis?

- ☐ A) Hypersensitivity vasculitis
- ☐ B) Ischemic ulcer
- ☐ C) Neuropathic ulcer
- ☐ D) Pyoderma gangrenosum
- ☒ E) Stasis ulcer
- ☐ F) Ulcerative lymphangitis



Correct Answer: E.

Venous insufficiency is a common cause of nonhealing ulcers on the lower extremities from venous stasis. In a healthy vascular system, return of venous blood from the legs is aided by muscle contraction which acts as a mechanical pump, along with valves preventing retrograde flow of blood. Diminished lower extremity muscle

Venous insufficiency is a common cause of nonhealing ulcers on the lower extremities from venous stasis. In a healthy vascular system, return of venous blood from the legs is aided by muscle contraction which acts as a mechanical pump, along with valves preventing retrograde flow of blood. Diminished lower extremity muscle contraction, such as in individuals who sit or stand for prolonged periods of time, results in chronically increased venous pressure (venous hypertension) leading to compromise of the valve structures. Any source of venous obstruction or increased venous pressure may initiate this cycle (eg, chronic thrombosis). Over time, venous insufficiency and stasis manifests with leg swelling, leg heaviness, and venous varicosities. The stasis of venous blood leads to poor perfusion of the skin, particularly along the medial aspect of the distal leg, as in this patient, causing venous ulcers, also called stasis ulcers, to occur. Other cutaneous findings of venous insufficiency include bronze discoloration of the leg due to hemosiderin deposition from extravasated red blood cells, woody induration from chronic edema, and dilated superficial veins. Many of these features are illustrated in the clinical image in this case. Venous ulcers will heal only when the underlying venous insufficiency is addressed.

Incorrect Answers: A, B, C, D, and F.

Hypersensitivity vasculitis (Choice A), otherwise known as leukocytoclastic vasculitis, is a common small vessel vasculitis that presents with blotchy, raised, purpuric skin rash. Vesicles and ulcers can be present but are uncommon. Causes include infection, autoimmune disease, and reactions to medications (especially antibiotics), though it is often idiopathic. This patient's history of cardiovascular disease and cutaneous manifestations are more consistent with chronic stasis dermatitis.

Ischemic ulcer (Choice B) can occur in peripheral artery disease. Nonhealing ulcers tend to occur at the sites most distal from the blood supply and thus, the most susceptible to ischemia, such as the distal digits. This patient likely has peripheral artery disease; however, he has palpable distal pulses. With signs of venous insufficiency on examination, stasis dermatitis as a cause of ulceration is more likely.

Neuropathic ulcer (Choice C) is common in patients with diabetes mellitus who have peripheral neuropathy. They usually occur in areas of impaired sensation because of chronic pressure. This patient has some impairment in sensation over the feet, however this ulcer is in an area affected by venous stasis and is distant from likely sites of chronic pressure such as the heel or skin over the distal metatarsal heads.

Pyoderma gangrenosum (Choice D) is a neutrophilic dermatosis that results in the rapid development of large, painful cutaneous ulcers, often on the legs. It could occur at the same time as a stasis ulcer; however, the ulcers often have a purple, raised border and cloudy discharge, features not seen in this patient's ulcer. Ulcers of pyoderma gangrenosum often occur in patients with systemic conditions such as acne, hidradenitis suppurativa, or sterile pyogenic arthritis.

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✓ 39. A 15-year-old girl is brought to the office for a well-child examination. Menarche has not occurred. She has no history of serious illness and takes no medications. Immunizations are up-to-date. Vital signs are within normal limits. She is below the 3rd percentile for height and at the 25th percentile for weight. Breast development is sexual maturity rating stage 2; there is no axillary or pubic hair. The remainder of the examination shows no abnormalities. Which of the following is most appropriate to determine if this patient is a candidate for growth hormone therapy?

- ☐ A) Chromosome analysis
- ☐ B) Genetic testing for Russell-Silver syndrome
- ☐ C) Growth hormone stimulation test
- ☐ D) Measurement of serum luteinizing hormone and follicle-stimulating hormone concentrations
- ☐ E) Measurement of serum thyroxine and thyroid-stimulating hormone concentrations
- ☒ F) Skeletal survey to assess epiphyses

Correct Answer: F.

Turner syndrome is a cause of primary amenorrhea, which is secondary to ovarian dysgenesis in the setting of a 45,XO genotype. Other signs of Turner syndrome include a short stature, cystic hygroma or webbed neck, swelling in the hands/feet, coarctation of the aorta, bicuspid aortic valve, horseshoe kidney, and infertility. Additionally, because of decreased estrogen concentrations, patients fail to develop secondary sex characteristics and evaluation discloses an underdeveloped uterus. Diagnosis is established through a karyotype analysis. Other laboratory studies that may aid in diagnosis are increased concentrations of luteinizing hormone and follicle-stimulating hormone due to the lack of negative feedback from estrogen. Turner syndrome management in adolescents commonly involves monitoring for cardiac complications, growth hormone replacement, and estrogen replacement to promote increased stature and development of secondary sex characteristics. Prior to growth hormone replacement, a skeletal survey is necessary to ensure the epiphyses are not fused.

Incorrect Answers: A, B, C, D, and E.

Turner syndrome is a cause of primary amenorrhea, which is secondary to ovarian dysgenesis in the setting of a 45,XO genotype. Other signs of Turner syndrome include a short stature, cystic hygroma or webbed neck, swelling in the hands/feet, coarctation of the aorta, bicuspid aortic valve, horseshoe kidney, and infertility. Additionally, because of decreased estrogen concentrations, patients fail to develop secondary sex characteristics and evaluation discloses an underdeveloped uterus. Diagnosis is established through a karyotype analysis. Other laboratory studies that may aid in diagnosis are increased concentrations of luteinizing hormone and follicle-stimulating hormone due to the lack of negative feedback from estrogen. Turner syndrome management in adolescents commonly involves monitoring for cardiac complications, growth hormone replacement, and estrogen replacement to promote increased stature and development of secondary sex characteristics. Prior to growth hormone replacement, a skeletal survey is necessary to ensure the epiphyses are not fused.

Incorrect Answers: A, B, C, D, and E.

Chromosome analysis (Choice A) is necessary to definitively diagnose Turner syndrome. It is not necessary, however, to assess whether the patient is a candidate for growth hormone therapy.

Genetic testing for Russell-Silver syndrome (Choice B), a condition that presents with asymmetric intrauterine growth restriction with relative macrocephaly, is unnecessary. The condition progresses with postnatal growth failure, and various morphologic abnormalities such as triangular facies, micrognathia, and clinodactyly. This patient does not present with these characteristics.

Growth hormone stimulation test (Choice C) is used to assess the ability of the patient to produce growth hormone to assess for deficiency, which can be because of a variety of factors, most commonly hypopituitarism. This is not necessary prior to administering growth hormone therapy.

Measurement of serum luteinizing hormone and follicle-stimulating hormone concentrations (Choice D) along with measurement of serum thyroxine and thyroid-stimulating hormone concentrations (Choice E) may assist in the diagnosis of various endocrine diseases and abnormalities of the hypothalamic-pituitary axis. These hormone concentrations are not necessary to evaluate prior to administering growth hormone therapy.

Educational Objective: Turner syndrome is a cause of primary amenorrhea, which is secondary to ovarian dysgenesis in the setting of a 45,XO genotype. Turner syndrome management in adolescents commonly involves monitoring for cardiac complications, growth hormone replacement, and estrogen replacement to promote increased stature and development of secondary sex characteristics. Prior to growth hormone replacement, a skeletal survey is necessary to ensure the epiphyses are not fused.



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- ✓ 40. A 31-year-old woman, gravida 2, para 2, comes to the office for a health maintenance examination. She says she has not eaten or drunk anything during the past 8 hours. Two years ago, she underwent bilateral tubal ligation. She has no known drug allergies. Her only medication is a daily multivitamin. She has smoked one pack of cigarettes daily for 16 years. She drinks two glasses of wine monthly. Her children are aged 5 and 11 years. She works at a doughnut shop. She is 157 cm (5 ft 2 in) tall and weighs 91 kg (200 lb); BMI is 37 kg/m². Her pulse is 76/min, and blood pressure is 165/100 mm Hg. Examination shows facial hair and truncal obesity. Her fingerstick blood glucose concentration is 130 mg/dL. Which of the following is the most likely diagnosis?
- ☐ A) Adrenal adenoma
 - ☒ B) Metabolic syndrome
 - ☐ C) Pituitary adenoma
 - ☐ D) Small cell lung cancer
 - ☐ E) Uncontrolled type 2 diabetes mellitus

Correct Answer: B.

Metabolic syndrome is a common disorder that is associated with an increased risk for developing cardiovascular disease, type 2 diabetes mellitus, and nonalcoholic fatty liver disease. It is characterized by hypertension, abdominal obesity, insulin resistance with hyperglycemia, increased serum triglyceride concentrations, and decreased HDL-cholesterol. The presence of three or more of these conditions is sufficient for diagnosis. First-line therapy consists of diet and activity modifications. Pharmacotherapy should be used to treat hypertension, hyperglycemia, and dyslipidemia if present. The most likely diagnosis in this case is metabolic syndrome as the patient is presenting with increased fasting blood glucose, hypertension, and obesity.

Incorrect Answers: A, C, D, and E.

An adrenal adenoma (Choice A) may lead to hyperaldosteronism, or Conn syndrome. Conn syndrome presents with various findings including hypernatremia, hypertension, and metabolic alkalosis with hypokalemia due to the loss of potassium and protons in urine. Metabolic syndrome is the more likely diagnosis in this case.

A pituitary adenoma (Choice C) may be inactive, inhibit proper production of hormones leading to hypopituitarism, or secrete hormones such as prolactin, follicle-stimulating

Correct Answer: B.

Metabolic syndrome is a common disorder that is associated with an increased risk for developing cardiovascular disease, type 2 diabetes mellitus, and nonalcoholic fatty liver disease. It is characterized by hypertension, abdominal obesity, insulin resistance with hyperglycemia, increased serum triglyceride concentrations, and decreased HDL-cholesterol. The presence of three or more of these conditions is sufficient for diagnosis. First-line therapy consists of diet and activity modifications. Pharmacotherapy should be used to treat hypertension, hyperglycemia, and dyslipidemia if present. The most likely diagnosis in this case is metabolic syndrome as the patient is presenting with increased fasting blood glucose, hypertension, and obesity.

Incorrect Answers: A, C, D, and E.

An adrenal adenoma (Choice A) may lead to hyperaldosteronism, or Conn syndrome. Conn syndrome presents with various findings including hypernatremia, hypertension, and metabolic alkalosis with hypokalemia due to the loss of potassium and protons in urine. Metabolic syndrome is the more likely diagnosis in this case.

A pituitary adenoma (Choice C) may be inactive, inhibit proper production of hormones leading to hypopituitarism, or secrete hormones such as prolactin, follicle-stimulating hormone, luteinizing hormone, or adrenocorticotrophic hormone. Pituitary adenomas can be asymptomatic or present with symptoms due to their hormonal actions, in addition to headache and visual changes in the setting of macroadenomas. Due to the findings in this case, metabolic syndrome is the more likely diagnosis.

Small cell lung cancer (Choice D) is a neoplasm of neuroendocrine cells and is associated with numerous paraneoplastic syndromes, including Cushing syndrome, syndrome of inappropriate antidiuretic hormone, Lambert-Eaton myasthenic syndrome, paraneoplastic limbic encephalitis, and subacute cerebellar degeneration. Small cell lung cancer does not typically result in obesity, hypertension, and an increased fasting blood glucose, which are present in this case.

Uncontrolled type 2 diabetes mellitus (Choice E) increases the risk for macrovascular complications (eg, coronary artery disease, peripheral arterial disease, stroke) and microvascular complications (eg, nephropathy, retinopathy, neuropathy). Although this patient does have an increased fasting blood glucose, metabolic syndrome is the more likely diagnosis.

Educational Objective: Metabolic syndrome is a common disorder that is associated with an increased risk for developing cardiovascular disease, type 2 diabetes mellitus, and nonalcoholic fatty liver disease. It is characterized by hypertension, abdominal obesity, insulin resistance with hyperglycemia, increased serum triglyceride concentrations, and decreased HDL-cholesterol.



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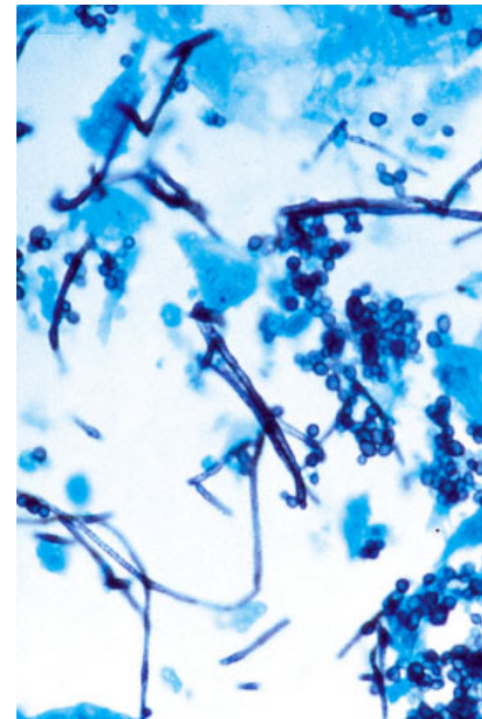
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✓ 41. A 32-year-old woman comes to the office because of a 3-day history of vaginal itching and white vaginal discharge. During this time, she also has had a burning sensation with urination. She has type 2 diabetes mellitus treated with insulin. She is sexually active with one male partner; they use condoms inconsistently. Physical examination shows no abnormalities. Pelvic examination shows an erythematous vagina with thick, white discharge. The uterus is nontender and normal in size and shape. There is no adnexal tenderness. Microscopy of the vaginal discharge is shown. Which of the following is the most appropriate next step in management?

- ☐ A) Bacterial culture of the vagina
- ☐ B) Metronidazole therapy
- ☒ C) Terconazole therapy
- ☐ D) Viral culture of the vagina
- ☐ E) Yeast culture of the vagina



Correct Answer: C.

Vulvovaginitis refers to inflammation of the vulva and vagina, typically presenting with vaginal itching, redness, and possible discharge. It has several causes, with one of the most common being vulvovaginal candidiasis, which presents with the symptoms of vulvovaginitis along with characteristic thick, white discharge. Risk factors

Correct Answer: C.

Vulvovaginitis refers to inflammation of the vulva and vagina, typically presenting with vaginal itching, redness, and possible discharge. It has several causes, with one of the most common being vulvovaginal candidiasis, which presents with the symptoms of vulvovaginitis along with characteristic thick, white discharge. Risk factors include estrogen use, diabetes mellitus, immunosuppression, and recent antibiotic use. Diagnosis is usually confirmed with potassium hydroxide and wet mount smears of vaginal discharge on microscopy, along with pH testing and fungal culture. Terconazole therapy is an antifungal treatment used for the topical treatment of vulvovaginal candidiasis.

Incorrect Answers: A, B, D, and E.

Bacterial culture of the vagina (Choice A) is not necessary as this patient is presenting with typical characteristics of vulvovaginal candidiasis. Bacterial infections of the vagina such as *Chlamydia trachomatis* or *Neisseria gonorrhoeae* are typically diagnosed with nucleic acid amplification test or polymerase chain reaction test rather than culture.

Metronidazole therapy (Choice B) is effective for the treatment of trichomoniasis and bacterial vaginosis. It would have no effect on vulvovaginal candidiasis.

Viral culture of the vagina (Choice D) is not necessary as this patient is presenting with the prototypical symptoms of vulvovaginal candidiasis. Viral culture may be necessary if there were concerns for herpes simplex virus; however, this patient is not presenting with genital vesicles or ulcers.

Yeast culture of the vagina (Choice E) would be inappropriate for the diagnosis of vulvovaginal candidiasis, as a culture is not necessary for the diagnosis. Diagnosis is typically performed through potassium hydroxide and wet mount smears of vaginal discharge. Waiting for results of a yeast culture would inappropriately delay care.

Educational Objective: Vulvovaginitis has several causes, with one of the most common being vulvovaginal candidiasis, which presents with vaginal itching, redness, and characteristic thick, white discharge. Terconazole is an antifungal agent used for the topical treatment of vulvovaginal candidiasis.

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42. A 16-year-old girl is brought to the emergency department immediately after she collapsed on her way to the bathroom at home. She has a history of anorexia nervosa and has had an 18-kg (40-lb) weight loss during the past 16 months. Menarche was at the age of 11 years, but her last menstrual period was 14 months ago. She does not drink alcohol or use illicit drugs. On arrival, she appears cachectic. She is 165 cm (5 ft 5 in) tall and weighs 36 kg (80 lb); BMI is 13 kg/m². Her pulse is 65/min, respirations are 12/min, and blood pressure is 85/55 mm Hg. Physical examination shows fine hair over the skin. An ECG is shown. This patient is most likely to have which of the following sets of serum electrolyte findings?

	Na ⁺ (mEq/L)	K ⁺ (mEq/L)	Cl ⁻ (mEq/L)	HCO ₃ ⁻ (mEq/L)
<input type="radio"/> A)	125	3.2	102	25
<input type="radio"/> B)	125	6.8	102	27
<input checked="" type="radio"/> C)	140	2.3	94	28
<input type="radio"/> D)	140	6.8	94	28
<input type="radio"/> E)	155	3.2	102	26

Correct Answer: C.

Anorexia nervosa is characterized by an intense fear of gaining weight, decreased self-worth related to body weight, and consequent binge eating and purging behavior (eg, vomiting, laxative or diuretic misuse) or oral intake restriction. Patients with anorexia nervosa often have a BMI less than 17 kg/m². As a result of insufficient nutrition and weight loss, the hypothalamus decreases gonadotropin-releasing hormone secretion, which leads to amenorrhea and pubertal delay or arrest. Physical examination can show dry, scaly skin, and fine hair or hair loss. Patients who use vomiting as their purging behavior may additionally have signs of dental erosion, knuckle abrasions, hypovolemia, hypokalemia, and hypochloremic metabolic alkalosis. The loss of gastric hydrochloric acid leads to hypochloremia and metabolic alkalosis (high-normal bicarbonate concentration in this patient). Hypokalemia is common, as increased bicarbonate leads to renal proton-potassium exchange and consequent potassium secretion. In severe cases, signs of hypovolemia such as hypotension may be present, which leads to increased aldosterone secretion and further potassium secretion. This patient's ECG shows U waves after the T waves (best seen in lead V2-V3), a sign of hypokalemia. In severe cases, decreased caloric intake and decreased vagal tone can cause bradycardia. Patients may present with a range of heart rates, though bradycardia is common. Treatment of anorexia nervosa is through a combined

Correct Answer: C.

Anorexia nervosa is characterized by an intense fear of gaining weight, decreased self-worth related to body weight, and consequent binge eating and purging behavior (eg, vomiting, laxative or diuretic misuse) or oral intake restriction. Patients with anorexia nervosa often have a BMI less than 17 kg/m². As a result of insufficient nutrition and weight loss, the hypothalamus decreases gonadotropin-releasing hormone secretion, which leads to amenorrhea and pubertal delay or arrest. Physical examination can show dry, scaly skin, and fine hair or hair loss. Patients who use vomiting as their purging behavior may additionally have signs of dental erosion, knuckle abrasions, hypovolemia, hypokalemia, and hypochloremic metabolic alkalosis. The loss of gastric hydrochloric acid leads to hypochloremia and metabolic alkalosis (high-normal bicarbonate concentration in this patient). Hypokalemia is common, as increased bicarbonate leads to renal proton-potassium exchange and consequent potassium secretion. In severe cases, signs of hypovolemia such as hypotension may be present, which leads to increased aldosterone secretion and further potassium secretion. This patient's ECG shows U waves after the T waves (best seen in lead V2-V3), a sign of hypokalemia. In severe cases, decreased caloric intake and decreased vagal tone can cause bradycardia. Patients may present with a range of heart rates, though bradycardia is common. Treatment of anorexia nervosa is through a combined medical and psychiatric approach and involves correcting fluid and electrolyte derangements alongside behavioral and pharmacologic therapy.

Incorrect Answers: A, B, D, and E.

Answers A, B, D, and E do not accurately reflect electrolyte changes common in anorexia nervosa. Hyponatremia is sometimes seen because of laxative or diuretic misuse (decreased effective arterial circulating volume leads to antidiuretic hormone secretion) or potomania. However, answers A, B, D, and E do not account for this patient's U waves, which indicate hypokalemia, one of the most common changes in anorexia nervosa. Hypernatremia is uncommon.

Educational Objective: The purging type of anorexia nervosa is associated with loss of gastric hydrochloric acid and consequent hypochloremia, metabolic alkalosis, and hypokalemia. Increased vagal tone in anorexia nervosa also leads to bradycardia. Hypokalemia is common, as increased bicarbonate leads to renal proton-potassium exchange and consequent potassium secretion. In severe cases, signs of hypovolemia such as hypotension may be present, which leads to increased aldosterone secretion and further potassium secretion.

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43. An 8-year-old boy with osteosarcoma of the left proximal tibia that is now metastatic to the lungs is transferred to the care of home hospice services for management of his symptoms. At the time of diagnosis 2 years ago, the patient was treated with surgical resection of the tumor with an above-knee amputation and chemotherapy. However, during the past 2 months, he has developed multiple metastatic pulmonary lesions that have not responded to chemotherapy. Today, he reports chest pain and difficulty breathing. He appears weak and cachectic. Vital signs are temperature 36.9°C (98.4°F), pulse 112/min, and respirations 28/min and shallow. Pulse oximetry on room air shows an oxygen saturation of 95%. Lungs are clear to auscultation. Cardiac examination discloses a grade 2/6 systolic murmur with a normal S₁ and S₂. Abdominal examination discloses no abnormalities. The parents say they want to focus care on management of their son's pain and symptoms. Which of the following is the most appropriate statement to the family regarding their wishes for the patient?

- ☐ A) Intramuscular opioids will allow rapid resolution of pain symptoms
- ☐ B) Intravenous opioids can only be given in the hospital
- ☐ C) Opioids can be initiated but must be discontinued if he develops hypoventilation
- ☐ D) Opioids should not be initiated since he already has signs of respiratory involvement
- ☒ E) Opioids will control both his dyspnea and pain

Correct Answer: E.

Opioid medications are commonly used for both pain and dyspnea at the end of life. Opioids have more of an evidence base for dyspnea than other medication classes, such as benzodiazepines. Using opioids for dyspnea aligns with the palliative care philosophy, which prioritizes symptom relief and quality of life over the prolongation of life. Though opioids may lead to further life-threatening respiratory depression, relief of this patient's symptoms takes priority over life prolongation under the palliative care philosophy. Palliative care applies to diverse chronic illness situations along with end-of-life situations, as in hospice care. Hospice care is a flexible model that can be delivered at home, at an assisted living, nursing care, or hospice facility, at the hospital, or at a combination of these locations.

Incorrect Answers: A, B, C, and D.



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- ☐ D) Opioids should not be initiated since he already has signs of respiratory involvement
- ☒ E) Opioids will control both his dyspnea and pain

Correct Answer: E.

Opioid medications are commonly used for both pain and dyspnea at the end of life. Opioids have more of an evidence base for dyspnea than other medication classes, such as benzodiazepines. Using opioids for dyspnea aligns with the palliative care philosophy, which prioritizes symptom relief and quality of life over the prolongation of life. Though opioids may lead to further life-threatening respiratory depression, relief of this patient's symptoms takes priority over life prolongation under the palliative care philosophy. Palliative care applies to diverse chronic illness situations along with end-of-life situations, as in hospice care. Hospice care is a flexible model that can be delivered at home, at an assisted living, nursing care, or hospice facility, at the hospital, or at a combination of these locations.

Incorrect Answers: A, B, C, and D.

Intramuscular opioids will allow rapid resolution of pain symptoms (Choice A) is inaccurate and does not address this patient's dyspnea. Also, intravenous opioids commonly have a shorter onset of action than intramuscular opioids.

Intravenous opioids can only be given in the hospital (Choice B) is inaccurate, as patients can receive intravenous opioids while in home hospice care with the assistance of hospice nurses.

Opioids can be initiated but must be discontinued if he develops hypoventilation (Choice C) and opioids should not be initiated since he already has signs of respiratory involvement (Choice D) are inaccurate. Respiratory depression and hypoventilation are life-limiting complications of opioid use but do not typically lead to symptoms that interfere with a patient's quality of life. Therefore, under the palliative care philosophy, these complications are acceptable given that opioids palliate dyspnea and pain.

Educational Objective: Opioid medications are commonly used for both pain and dyspnea at the end of life. Using opioids for symptom relief aligns with the palliative care philosophy, which prioritizes symptom relief and quality of life over the prolongation of life.



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44. A 17-year-old girl is brought to the office by her parents because of a 3-week history of changes in her behavior. She previously received grades of A's in school; during the past month, she has received grades of C's. She runs on the cross-country team at school. The patient's mother also is concerned about her daughter's diet, noting that she follows a high-carbohydrate diet before races and otherwise eats only vegetables. When interviewed alone, the patient says that she has had difficulty concentrating in school during the past 2 weeks because she is "tired all of the time" and is not interested in the classes like she used to be. During this time, she also has had difficulty sleeping. She says she sometimes eats a large amount of junk food and then feels guilty about it. She refuses to answer questions about purging. She has no other history of serious illness. Her only medication is a daily multivitamin. She is 170 cm (5 ft 7 in) tall and weighs 54 kg (120 lb); BMI is 19 kg/m². Vital signs are within normal limits. Physical examination shows no abnormalities. On mental status examination, she has a dysphoric affect and describes her mood as "irritable." She has thought about death but has no suicidal intent. Which of the following medications is contraindicated in this patient?

- ☒ A) Bupropion
- ☐ B) Desipramine
- ☐ C) Fluoxetine
- ☐ D) Mirtazapine
- ☐ E) Venlafaxine

Correct Answer: A.

This patient with bingeing behavior and evasiveness around questions about purging likely has bulimia nervosa (purging type). Bulimia nervosa (purging type) involves cycles of uncontrollable eating and compensatory behaviors such as vomiting, or laxative or diuretic overuse that occur at least once weekly for 3 months or more. Unlike patients with anorexia nervosa, patients with bulimia nervosa typically have a normal BMI and do not have amenorrhea. As a result of the loss of gastric hydrochloric acid and compensatory renal activity, electrolyte abnormalities are common. Seizure risk is increased in patients with bulimia nervosa because of electrolyte disturbances, hypoglycemia, comorbid substance use, and an increased prevalence of functional seizure disorders. This patient also demonstrates depressed mood and several other depressive symptoms (insomnia, decreased interest, decreased energy, difficulty concentrating, thoughts of death) consistent with major depressive disorder and may benefit from an antidepressant. However, bupropion should be avoided given its association with seizures.

Incorrect Answers: B, C, D, and E.



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describes her mood as “irritable.” She has thought about death but has no suicidal intent. Which of the following medications is contraindicated in this patient?

- ☒ A) Bupropion
- ☐ B) Desipramine
- ☐ C) Fluoxetine
- ☐ D) Mirtazapine
- ☐ E) Venlafaxine

Correct Answer: A.

This patient with bingeing behavior and evasiveness around questions about purging likely has bulimia nervosa (purging type). Bulimia nervosa (purging type) involves cycles of uncontrollable eating and compensatory behaviors such as vomiting, or laxative or diuretic overuse that occur at least once weekly for 3 months or more. Unlike patients with anorexia nervosa, patients with bulimia nervosa typically have a normal BMI and do not have amenorrhea. As a result of the loss of gastric hydrochloric acid and compensatory renal activity, electrolyte abnormalities are common. Seizure risk is increased in patients with bulimia nervosa because of electrolyte disturbances, hypoglycemia, comorbid substance use, and an increased prevalence of functional seizure disorders. This patient also demonstrates depressed mood and several other depressive symptoms (insomnia, decreased interest, decreased energy, difficulty concentrating, thoughts of death) consistent with major depressive disorder and may benefit from an antidepressant. However, bupropion should be avoided given its association with seizures.

Incorrect Answers: B, C, D, and E.

Desipramine (Choice B), fluoxetine (Choice C), mirtazapine (Choice D), and venlafaxine (Choice E) are antidepressant medications used to treat anxiety and depressive disorders. None of these medications are associated with a clinically significant seizure risk at therapeutic dose ranges. Patients with eating disorders may become distressed at the weight gain associated with mirtazapine and may struggle to adhere, but this is not a strict contraindication.

Educational Objective: Bulimia nervosa (purging type) involves cycles of uncontrollable eating and compensatory behaviors such as vomiting, or laxative or diuretic overuse that occur at least once weekly for 3 months or more. Bulimia nervosa is associated with an increased seizure risk, which is a contraindication to using bupropion.



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- ✓ 45. A previously healthy 77-year-old woman comes to the office because of a 4-month history of hoarseness. She has not had difficulty breathing or swallowing. She has had a chronic cough and gastroesophageal reflux disease for 5 years. Her only medication is omeprazole. She has smoked two packs of cigarettes daily for 60 years. Her temperature is 37.2°C (99.0°F), pulse is 76/min, respirations are 20/min, and blood pressure is 102/66 mm Hg. On examination, there is no cervical or supraclavicular lymphadenopathy. Oropharyngeal examination shows no abnormalities. The thyroid gland is not enlarged and moves with swallowing; no masses are palpated. Cardiopulmonary examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) Barium swallow
 - ☐ B) CT scan of the neck
 - ☒ C) Flexible laryngoscopy
 - ☐ D) Ultrasonography of the thyroid gland
 - ☐ E) Observation and follow-up examination in 2 months

Correct Answer: C.

Laryngeal carcinoma may present with hoarseness, vocal changes, persistent cough, stridor, or dysphagia, and is more common in patients with a history of smoking. The majority of laryngeal carcinomas are squamous and are frequently located in the glottic or supraglottic region. Supraglottic lesions are likely to induce dysphagia, whereas hoarseness is an early symptom of glottic lesions due to the involvement of the vocal cords. The diagnosis is established by direct tumor visualization, which may be accomplished by flexible laryngoscopy. A thorough examination of the neck is also essential to determine the extent of the tumor and to identify associated lymphadenopathy, which may indicate nodal metastasis. Distant metastases may also occur. CT or PET scan may be useful for characterizing metastatic disease. Early-stage laryngeal carcinoma is associated with a high survival rate, although locally extensive or metastatic disease is more difficult to treat. Treatment involves surgical excision, radiotherapy, and/or chemotherapy.

Incorrect Answers: A, B, D, and E.

Barium swallow (Choice A) would not be beneficial in this patient. Given her smoking history, the leading diagnosis is laryngeal cancer. Barium swallow studies can be beneficial in identifying a multitude of pathologies; however, laryngeal cancer is best diagnosed by direct visualization.



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- ☐ D) Ultrasonography of the thyroid gland
- ☐ E) Observation and follow-up examination in 2 months

Correct Answer: C.

Laryngeal carcinoma may present with hoarseness, vocal changes, persistent cough, stridor, or dysphagia, and is more common in patients with a history of smoking. The majority of laryngeal carcinomas are squamous and are frequently located in the glottic or supraglottic region. Supraglottic lesions are likely to induce dysphagia, whereas hoarseness is an early symptom of glottic lesions due to the involvement of the vocal cords. The diagnosis is established by direct tumor visualization, which may be accomplished by flexible laryngoscopy. A thorough examination of the neck is also essential to determine the extent of the tumor and to identify associated lymphadenopathy, which may indicate nodal metastasis. Distant metastases may also occur. CT or PET scan may be useful for characterizing metastatic disease. Early-stage laryngeal carcinoma is associated with a high survival rate, although locally extensive or metastatic disease is more difficult to treat. Treatment involves surgical excision, radiotherapy, and/or chemotherapy.

Incorrect Answers: A, B, D, and E.

Barium swallow (Choice A) would not be beneficial in this patient. Given her smoking history, the leading diagnosis is laryngeal cancer. Barium swallow studies can be beneficial in identifying a multitude of pathologies; however, laryngeal cancer is best diagnosed by direct visualization.

CT scan of the neck (Choice B) is not the best next step in diagnosis. CT scans can be used in the identification of metastases from laryngeal cancer but not generally used in the diagnosis of the primary lesion. Direct visualization, such as with flexible laryngoscopy, is preferred.

Ultrasonography of the thyroid gland (Choice D) can be used when thyroid pathology is suspected. This patient has a grossly normal thyroid examination, with no masses palpated. This finding along with the significant comorbidities make laryngeal cancer more likely.

Observation and follow-up examination in 2 months (Choice E) would not be appropriate for this patient. The presence of hoarseness in a patient with a significant smoking history should raise concern for a malignant lesion within the respiratory tract. Workup should be initiated immediately.

Educational Objective: Laryngeal carcinoma is common in patients with a history of smoking and may present with hoarseness, vocal changes, persistent cough, stridor, or dysphagia. The diagnosis is established by direct tumor visualization, which may be accomplished by flexible laryngoscopy.



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✓ 46. A 77-year-old man is brought to the clinic by his sister for a follow-up examination. The sister reports he was well until sustaining a head injury in a motor vehicle collision 7 months ago. She notes, "This changed him." During the past 3 months, he has been "slowing down" and having "urinary accidents." He has no other history of serious illness. His only medications are a multivitamin and ibuprofen as needed. He is a retired accountant. On neurologic examination, he has difficulty starting to walk from a sitting or standing position, a shuffling gait, and no arm swing bilaterally. Glabellar and palmomental reflex testing is positive. On mental status examination, he has a flat affect and monotonous speech. Brain imaging is most likely to show which of the following in this patient?

- ☐ A) Chronic subdural hematoma in the occipital lobe
- ☐ B) Low T2 signal intensity in the globus pallidus
- ☐ C) Multiple patches of demyelination
- ☐ D) Prominent atrophy around the sylvian fissure
- ☒ E) Widely dilated ventricles

Correct Answer: E.

This patient's presentation is consistent with normal pressure hydrocephalus (NPH), which is characterized by a combination of dementia (eg, frontal release signs and apathy), gait instability (eg, magnetic, shuffling gait), and urinary incontinence. NPH refers to a type of communicating (nonobstructive) hydrocephalus in which the ventricles are enlarged, leading to damage of the white matter tracts connecting the frontal lobes and basal ganglia. Signs of increased intracranial pressure (eg, papilledema, postural headaches) are typically absent. Many cases of NPH are idiopathic, though some are secondary to a defect in cerebrospinal fluid drainage from the ventricles due to scarring or obstruction of the ventricular lining from prior traumatic injury (as in this patient), hemorrhage, or meningitis. The diagnosis is primarily clinical, although ventriculomegaly on brain imaging is suggestive. The most appropriate next step in management is a lumbar puncture to assess the opening pressure and clinical response to removing cerebrospinal fluid. Placement of a ventricular shunt may be needed for long-term management.

Incorrect Answers: A, B, C, and D.

Chronic subdural hematoma in the occipital lobe (Choice A) can result from head trauma, but commonly presents with headache (absent in this patient) along with

Correct Answer: E.

This patient's presentation is consistent with normal pressure hydrocephalus (NPH), which is characterized by a combination of dementia (eg, frontal release signs and apathy), gait instability (eg, magnetic, shuffling gait), and urinary incontinence. NPH refers to a type of communicating (nonobstructive) hydrocephalus in which the ventricles are enlarged, leading to damage of the white matter tracts connecting the frontal lobes and basal ganglia. Signs of increased intracranial pressure (eg, papilledema, postural headaches) are typically absent. Many cases of NPH are idiopathic, though some are secondary to a defect in cerebrospinal fluid drainage from the ventricles due to scarring or obstruction of the ventricular lining from prior traumatic injury (as in this patient), hemorrhage, or meningitis. The diagnosis is primarily clinical, although ventriculomegaly on brain imaging is suggestive. The most appropriate next step in management is a lumbar puncture to assess the opening pressure and clinical response to removing cerebrospinal fluid. Placement of a ventricular shunt may be needed for long-term management.

Incorrect Answers: A, B, C, and D.

Chronic subdural hematoma in the occipital lobe (Choice A) can result from head trauma, but commonly presents with headache (absent in this patient) along with confusion, memory impairment, lethargy, and vision changes. As well, the onset of symptoms is typically insidious rather than sudden.

Low T2 signal intensity in the globus pallidus (Choice B) is common in Wilson disease secondary to copper accumulation. Wilson disease commonly presents with chorea, dystonia, parkinsonism, gait abnormalities, ocular Kayser-Fleischer rings, and cirrhosis. Other than gait abnormalities, this patient does not show signs of Wilson disease, and urinary incontinence is uncommon in Wilson disease.

Multiple patches of demyelination (Choice C) are consistent with multiple sclerosis, which presents with focal neurologic deficits separated in space and time. This patient presents with chronic, progressive cognitive and gait deficits rather than episodic focal neurologic deficits.

Prominent atrophy around the sylvian fissure (Choice D) is common in primary progressive aphasia, a frontotemporal dementia variant. This patient does not demonstrate aphasia.

Educational Objective: The triad of cognitive impairment (including frontal release signs), urinary incontinence, and gait instability should raise concern for normal pressure hydrocephalus. Ventriculomegaly on neuroimaging supports the diagnosis.

- ✓ 47. A 25-year-old woman comes to a military outpatient clinic for an examination prior to a deployment to South Asia. She is in good health and feels well. She has had three urinary tract infections during the past year and is concerned about another one occurring during her deployment. Her only medication is an oral contraceptive. Vital signs are within normal limits. Examination shows no abnormalities. Which of the following is the most appropriate response to this patient's concern?
- ☐ A) Begin prophylactic atovaquone-proguanil therapy against both malaria and urinary tract infections
 - ☒ B) Give the patient a prescription for nitrofurantoin and guidance about self-treatment of urinary tract infections
 - ☐ C) Recommend that the patient use a spermicide rather than an oral contraceptive to decrease her risk for a urinary tract infection
 - ☐ D) Tell the patient that an increased fluid intake, especially of cranberry juice, has been shown to prevent urinary tract infections during deployments
 - ☐ E) Tell the patient that women wearing underwear containing nylon or polyester rather than cotton has been associated with fewer urinary tract infections during deployment

Correct Answer: B.

Give the patient a prescription for nitrofurantoin and guidance about self-treatment of urinary tract infections (UTIs) is correct. This healthy patient is about to deploy to an area where there may be limited health resources available. It is reasonable to provide her with a prescription for antibiotics and appropriate instructions for use. Lower UTIs present with dysuria, urinary frequency and urgency, and suprapubic discomfort. They occur more frequently in women than in men due to a shorter urethra and favorable regional environment for bacterial growth. Risk factors include the presence of a urinary catheter, anatomic genitourinary defects, diabetes mellitus, pregnancy, and frequent or recent sexual intercourse. Urinalysis will typically show bacteriuria, white blood cells, positive leukocyte esterase, and positive nitrites depending on the infectious organism. Treatment of uncomplicated UTIs typically consists of outpatient antibiotic management with trimethoprim-sulfamethoxazole, nitrofurantoin, or cephalexin. Preventive measures for UTIs include voiding immediately after coitus, oral hydration, and improvement of hygiene practices to decrease the introduction of bacteria to the urethra. In patients with frequent UTIs, management can involve prophylactic postcoital or daily antibiotic therapy. Any patient who is instructed to self-treat should be given thorough information about competing diagnoses, especially urethritis or pelvic inflammatory disease, and encouraged to seek prompt care if the symptoms do not improve with empiric therapy.

Incorrect Answers: A, C, D, and E.



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area where there may be limited health resources available. It is reasonable to provide her with a prescription for antibiotics and appropriate instructions for use. Lower UTIs present with dysuria, urinary frequency and urgency, and suprapubic discomfort. They occur more frequently in women than in men due to a shorter urethra and favorable regional environment for bacterial growth. Risk factors include the presence of a urinary catheter, anatomic genitourinary defects, diabetes mellitus, pregnancy, and frequent or recent sexual intercourse. Urinalysis will typically show bacteriuria, white blood cells, positive leukocyte esterase, and positive nitrites depending on the infectious organism. Treatment of uncomplicated UTIs typically consists of outpatient antibiotic management with trimethoprim-sulfamethoxazole, nitrofurantoin, or cephalexin. Preventive measures for UTIs include voiding immediately after coitus, oral hydration, and improvement of hygiene practices to decrease the introduction of bacteria to the urethra. In patients with frequent UTIs, management can involve prophylactic postcoital or daily antibiotic therapy. Any patient who is instructed to self-treat should be given thorough information about competing diagnoses, especially urethritis or pelvic inflammatory disease, and encouraged to seek prompt care if the symptoms do not improve with empiric therapy.

Incorrect Answers: A, C, D, and E.

Begin prophylactic atovaquone-proguanil therapy against both malaria and UTIs (Choice A) is only partially an appropriate measure for this patient. Atovaquone-proguanil does not have activity against common UTI pathogens. It is appropriate for malaria prophylaxis, but not for treatment of UTIs.

Recommend that the patient use a spermicide rather than an oral contraceptive to decrease her risk for a UTI (Choice C) is incorrect. Spermicide is less reliable than oral contraceptives in prevention of pregnancy, and it has not been shown to prevent UTIs.

Tell the patient that an increased fluid intake, especially of cranberry juice, has been shown to prevent UTIs during deployments (Choice D) is partially correct. Remaining well hydrated can prevent UTIs through increased voiding and bacterial clearance. However, as of 2023, there is no clear consensus across studies that cranberry juice prevents UTIs during deployments. Research is mixed around whether cranberry juice does or does not prevent UTIs.

Tell the patient that women wearing underwear containing nylon or polyester rather than cotton has been associated with fewer UTIs during deployment (Choice E) is incorrect. Cotton is a breathable and absorbent fabric, and generally is considered a better choice for pubovaginal health. Loose-fitting, breathable clothing can help prevent bacterial overgrowth near the urethral orifice.

Educational Objective: Preventive measures for urinary tract infections (UTIs) include voiding immediately after coitus, oral hydration, and improvement of hygiene practices to decrease the introduction of bacteria to the urethra. In patients with frequent UTIs, management can involve prophylactic postcoital or daily antibiotic therapy. Any patient who is instructed to self-treat should be given thorough information about competing diagnoses, especially urethritis or pelvic inflammatory disease.



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- ✓ 48. A 52-year-old man with HIV infection comes to the office because of a 3-month history of increasingly severe pain of his knees. He says he has 20 minutes of stiffness and increased pain after he awakens in the morning or sits for long periods. He has not had redness, swelling, or warmth. He has no history of trauma to the knees. Acetaminophen provides moderate relief. Other medications are antiretroviral therapy and vitamin D supplementation. He says he does not want to take any more pills. He is 180 cm (5 ft 11 in) tall and weighs 100 kg (220 lb); BMI is 31 kg/m². Vital signs are within normal limits. Cardiopulmonary examination shows no abnormalities. Examination of the knees shows crepitus and small effusions; there is no erythema, warmth, or decreased range of motion. Lachman and McMurray tests show no abnormalities. X-rays of the knees show decreased joint space and osteophyte formation. The patient begins a low-impact exercise regimen. Two months later, he returns to the office for follow-up examination. He has had no progression of his symptoms and a 4.5-kg (10-lb) weight loss. He continues to take acetaminophen and has had no adverse effects. The patient asks if he will eventually develop severe osteoarthritis and wants to discuss potential treatment options. Which of the following is the most appropriate recommendation for this patient?
- ☒ A) Continued oral acetaminophen therapy
 - ☐ B) Intra-articular hyaluronic acid therapy
 - ☐ C) Intra-articular triamcinolone therapy
 - ☐ D) Oral glucosamine and chondroitin therapy
 - ☐ E) Total knee replacement

Correct Answer: A.

Osteoarthritis is a noninflammatory arthropathy that occurs secondary to deterioration of articular cartilage. It typically occurs in older patients and may affect any joint, but the hips and knees are commonly affected as a result of chronic weight bearing, especially in patients with obesity. Osteoarthritis is not associated with infectious or inflammatory symptoms and is generally insidious in onset. Patients typically report chronic pain in a joint that worsens with movement or exertion. The pain improves with rest, often with limited range of motion due to underlying joint space narrowing and pain. Imaging may show joint space narrowing and osteophyte formation and may also include subchondral cysts or sclerotic changes. First-line treatment is with acetaminophen. Additional options include NSAIDs in the absence of contraindications, intra-articular injections (eg, cortisone), and total joint replacement for severe or refractory cases. In this case, continued oral acetaminophen therapy, in addition to continuation of his low-impact exercise regimen, is the most appropriate recommendation for this patient as it has provided moderate pain relief without adverse effects.



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☐ E) Total knee replacement

Correct Answer: A.

Osteoarthritis is a noninflammatory arthropathy that occurs secondary to deterioration of articular cartilage. It typically occurs in older patients and may affect any joint, but the hips and knees are commonly affected as a result of chronic weight bearing, especially in patients with obesity. Osteoarthritis is not associated with infectious or inflammatory symptoms and is generally insidious in onset. Patients typically report chronic pain in a joint that worsens with movement or exertion. The pain improves with rest, often with limited range of motion due to underlying joint space narrowing and pain. Imaging may show joint space narrowing and osteophyte formation and may also include subchondral cysts or sclerotic changes. First-line treatment is with acetaminophen. Additional options include NSAIDs in the absence of contraindications, intra-articular injections (eg, cortisone), and total joint replacement for severe or refractory cases. In this case, continued oral acetaminophen therapy, in addition to continuation of his low-impact exercise regimen, is the most appropriate recommendation for this patient as it has provided moderate pain relief without adverse effects.

Incorrect Answers: B, C, D, and E.

Intra-articular hyaluronic acid therapy (Choice B) may be a reasonable treatment option for patients with mild to moderate knee osteoarthritis. However, it is a more invasive approach to management for this patient who is receiving moderate relief from oral acetaminophen.

Intra-articular triamcinolone therapy (Choice C) may be a reasonable treatment option for osteoarthritis of the knee to provide short-term pain relief. However, intra-articular triamcinolone is chondrotoxic and may hasten the degenerative process.

Oral glucosamine and chondroitin therapy (Choice D) has not been shown to provide significant benefit in knee osteoarthritis. The continuation of oral acetaminophen therapy for this patient would be the most appropriate recommendation.

Total knee replacement (Choice E) may be a reasonable treatment option for patients with severe knee osteoarthritis. Total knee replacement is not indicated for this patient as he has been receiving moderate benefit from oral acetaminophen and has been able to tolerate a low-impact exercise program.

Educational Objective: Knee osteoarthritis is a common condition that generally has an insidious onset. Patients often report pain that worsens with movement or exertion. The pain improves with rest, often with limited range of motion due to underlying joint space narrowing and pain. Imaging may show subchondral cysts or sclerosis, joint space narrowing, or osteophyte formation. Initial conservative management includes physical therapy and oral acetaminophen therapy.



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49. A 30-year-old man with a 7-year history of Crohn disease is admitted to the hospital because of a 2-month history of intermittent temperatures to 38.9°C (102.0°F), nonproductive cough, night sweats, and fatigue. He has not had diarrhea, or blood or mucus in his stools. His Crohn disease symptoms have been well controlled with subcutaneous adalimumab for the past year. Chest x-ray 2 weeks ago showed lingular and right lower lobe infiltrates, and he was treated with successive courses of levofloxacin and azithromycin for presumed community-acquired pneumonia without improvement of his symptoms. Medical history otherwise is unremarkable, and his only other routine medication is a daily multivitamin. He does not smoke cigarettes or drink alcoholic beverages. He has no pets. Three months ago, he spent 1 week racing dune buggies in the Southwestern USA, but he has not traveled outside of the country. He is 178 cm (5 ft 10 in) tall and weighs 72 kg (160 lb); BMI is 23 kg/m². Temperature is 38.5°C (101.3°F), pulse is 105/min and regular, respirations are 20/min, and blood pressure is 112/68 mm Hg. Crackles are heard in both lower lung fields. Results of fiberoptic bronchoscopy with bronchoalveolar lavage are shown. Which of the following is the most appropriate pharmacotherapy?

- ☐ A) Doxycycline
- ☒ B) Fluconazole
- ☐ C) Isoniazid, pyrazinamide, ethambutol, and rifampin
- ☐ D) Trimethoprim-sulfamethoxazole
- ☐ E) Vancomycin

Correct Answer: B.

Coccidioides is an endemic fungus of the Southwestern United States and central valley of California that typically causes coccidioidomycosis, a self-limited respiratory illness. Signs and symptoms include fever, fatigue, cough, arthralgia, and myalgia. Patients may also present with erythema nodosum. Coccidioidomycosis can potentially present with disseminated disease, especially in immunocompromised patients, and cause infections of the skin, bone, and central nervous system. Silver stain of sputum or tissue biopsy shows large spherules containing endospores. Diagnosis can be facilitated with enzyme-linked immunosorbent assay testing and be confirmed with polymerase chain reaction test. Treatment involves oral or intravenous antifungals, including agents from the azole (eg, fluconazole) or polyene classes.

Incorrect Answers: A, C, D, and E.

potentially present with disseminated disease, especially in immunocompromised patients, and cause infections of the skin, bone, and central nervous system. Silver stain of sputum or tissue biopsy shows large spherules containing endospores. Diagnosis can be facilitated with enzyme-linked immunosorbent assay testing and be confirmed with polymerase chain reaction test. Treatment involves oral or intravenous antifungals, including agents from the azole (eg, fluconazole) or polyene classes.

Incorrect Answers: A, C, D, and E.

Doxycycline (Choice A) is not indicated in the treatment of *Coccidioides* infections. This patient, presenting with respiratory symptoms, has previously received levofloxacin and azithromycin courses for presumed community-acquired pneumonia without improvement in his symptoms. Even without the definitive sputum sample, it is unlikely that doxycycline would be effective in this patient after these other antibiotics had failed.

Isoniazid, pyrazinamide, ethambutol, and rifampin (Choice C) is an appropriate treatment regimen for patients with pulmonary tuberculosis, which usually presents with systemic symptoms and cavitary lesions on chest x-ray. This patient does have some symptoms that could be consistent with tuberculosis, including fatigue, cough, and night sweats. However, the sputum sample displayed spherules with endospores, which are not consistent with tuberculosis.

Trimethoprim-sulfamethoxazole (Choice D) can be used to treat a variety of infections, such as urinary tract infections and skin and soft tissue infections. Additionally, it can be used to treat *Pneumocystis jirovecii* an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients. Chest imaging typically shows diffuse, bilateral infiltrates often prominently about the hila; spherules with endospores would not be expected.

Vancomycin (Choice E) would not be effective in the treatment of *Coccidioides* infection. Vancomycin is a broad-spectrum antibiotic commonly used in the treatment of sepsis or other systemic infections. It has no activity against fungal pathogens.

Educational Objective: Coccidiomycosis is a fungal infection endemic to the Southwestern United States and to the central valley of California that typically presents as a self-limited respiratory illness. Signs and symptoms typically include fever, fatigue, cough, arthralgia, and myalgia. A sputum sample will show large spherules containing endospores.



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✓ 50. An orthopaedic surgeon has completed his first surgical procedure of the day in an operating room (OR) where he has booked five cases in sequence for the day. After the first patient is taken to the recovery room, the surgeon visits the next patient in the OR holding area at 9:25 AM in anticipation of the start of the operation before 10 AM. The patient is a 25-year-old woman with a closed comminuted fracture of the humerus that will be repaired with open reduction and internal fixation using metal plates and screws. She is 168 cm (5 ft 6 in) tall and weighs 64 kg (142 lb); BMI is 23 kg/m². The surgeon orders prophylactic intravenous administration of 1 g of cefazolin, which is completed at 9:30 AM. The OR is suddenly commandeered for an emergency case. No other OR is open, so the humeral operation is postponed. The patient eventually enters the OR at 11:30 AM. The Surgical Care Improvement Project guidelines, which are a core measure by the Centers for Medicare and Medicaid Services, recommend that intravenous antibiotic therapy be administered within 1 hour prior to the first surgical incision. Which of the following is the most appropriate management of this patient prior to proceeding with the operation?

- ☒ A) Administer another 1-g dose of cefazolin now
- ☐ B) Administer an equivalent dose of gentamicin now
- ☐ C) Delay the procedure until 3:30 PM and administer another 1-g dose of cefazolin
- ☐ D) Wait until the next day to proceed with administering additional antibiotic prophylaxis

Correct Answer: A.

Administer another 1-g dose of cefazolin now is the correct answer. This patient was administered a dose of cefazolin 2 hours prior, due to a delay in the surgical case. As the vignette suggests, clinical guidelines indicate patients should be administered prophylactic antibiotics within 1 hour prior to the first surgical incision. Additionally, the half-life of cefazolin is approximately 2 hours, supporting that this patient would benefit from an additional dose of the medication. Cefazolin is a first-generation cephalosporin effective against common organisms of the skin, including *Streptococcus* species and *Staphylococcus* species, and is frequently used for infection prophylaxis.

Incorrect Answers: B, C, and D.

Administer an equivalent dose of gentamicin now (Choice B) is incorrect. Gentamicin is an aminoglycoside medication used for the treatment of infections and is effective against gram-negative bacteria. Gentamicin has adverse effects that include renal toxicity and in rare cases hearing loss. Although gentamicin is effective against gram-negative bacteria, it is not routinely used for surgical prophylaxis against common skin flora and therefore is not recommended by surgical guidelines.



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- ☐ B) Administer an equivalent dose of gentamicin now
- ☐ C) Delay the procedure until 3:30 PM and administer another 1-g dose of cefazolin
- ☐ D) Wait until the next day to proceed with administering additional antibiotic prophylaxis

Correct Answer: A.

Administer another 1-g dose of cefazolin now is the correct answer. This patient was administered a dose of cefazolin 2 hours prior, due to a delay in the surgical case. As the vignette suggests, clinical guidelines indicate patients should be administered prophylactic antibiotics within 1 hour prior to the first surgical incision. Additionally, the half-life of cefazolin is approximately 2 hours, supporting that this patient would benefit from an additional dose of the medication. Cefazolin is a first-generation cephalosporin effective against common organisms of the skin, including *Streptococcus* species and *Staphylococcus* species, and is frequently used for infection prophylaxis.

Incorrect Answers: B, C, and D.

Administer an equivalent dose of gentamicin now (Choice B) is incorrect. Gentamicin is an aminoglycoside medication used for the treatment of infections and is effective against gram-negative bacteria. Gentamicin has adverse effects that include renal toxicity and in rare cases hearing loss. Although gentamicin is effective against gram-negative bacteria, it is not routinely used for surgical prophylaxis against common skin flora and therefore is not recommended by surgical guidelines.

Delay the procedure until 3:30 pm and administer another 1-g dose of cefazolin (Choice C) is incorrect. Cefazolin is a first-generation cephalosporin antibiotic that is effective against common skin flora, including *Streptococcus* species and *Staphylococcus* species. Cefazolin has a half-life of approximately 2 hours, and the patient should be provided an additional dose of the antibiotic prior to surgery.

Wait until the next day to proceed with administering additional antibiotic prophylaxis (Choice D) is incorrect. The patient was previously provided a dose of cefazolin, which has a short half-life following administration. To adhere to surgical guidelines, another dose of cefazolin should be administered within 1 hour prior to surgical incision.

Educational Objective: Cefazolin is a first-generation cephalosporin antibiotic. Like other first-generation cephalosporins, cefazolin is effective against common skin flora, including *Streptococcus* species and *Staphylococcus* species. Cefazolin has established efficacy in preventing perioperative surgical infection, and guidelines recommend administration of cefazolin within 1 hour prior to surgical incision.

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- ✓ 1. An 18-year-old man is brought to the emergency department 10 minutes after sustaining a gunshot wound to the abdomen. On arrival, his pulse is 120/min, respirations are 16/min, and blood pressure is 90/60 mm Hg. Examination shows an entrance wound in the right lower quadrant of the abdomen; no exit wound is identified. The abdomen is diffusely tender with voluntary guarding. Bowel sounds are hypoactive. After fluid resuscitation, which of the following is the most appropriate next step in diagnosis?
- ☐ A) Ultrasonography of the abdomen
 - ☐ B) CT scan of the abdomen
 - ☐ C) Laparoscopy
 - ☐ D) Peritoneal lavage
 - ☒ E) Laparotomy

Correct Answer: E.

Abdominal organ laceration and/or rupture as a result of penetrating traumatic injury can cause large amounts of blood to leak into the peritoneal and retroperitoneal spaces, which can result in hemodynamic instability characterized by tachycardia and, if severe, hypotension. Gunshot wounds are particularly high energy and can cause severe intra-abdominal injury including hemorrhage and viscus perforation. For hemodynamically stable patients, minor penetrating injuries may be first investigated with abdominal imaging such as a CT scan. For unstable patients, such as this patient with hypotension and tachycardia, exploratory laparotomy is required for immediate hemorrhage control and the repair of identified injuries.

Incorrect Answers: A, B, C, and D.

Ultrasonography of the abdomen (Choice A), such as a focused assessment with sonography for trauma (FAST) examination, can be a helpful adjunct imaging modality in the setting of unstable blunt trauma patients, not penetrating trauma patients. A FAST examination can show intraperitoneal free fluid. In addition, CT scan of the abdomen (Choice B) is an imaging modality that can elucidate the location and extent of penetrating injury and abdominal organs involved. A CT scan can provide more detail about

Correct Answer: E.

Abdominal organ laceration and/or rupture as a result of penetrating traumatic injury can cause large amounts of blood to leak into the peritoneal and retroperitoneal spaces, which can result in hemodynamic instability characterized by tachycardia and, if severe, hypotension. Gunshot wounds are particularly high energy and can cause severe intra-abdominal injury including hemorrhage and viscus perforation. For hemodynamically stable patients, minor penetrating injuries may be first investigated with abdominal imaging such as a CT scan. For unstable patients, such as this patient with hypotension and tachycardia, exploratory laparotomy is required for immediate hemorrhage control and the repair of identified injuries.

Incorrect Answers: A, B, C, and D.

Ultrasonography of the abdomen (Choice A), such as a focused assessment with sonography for trauma (FAST) examination, can be a helpful adjunct imaging modality in the setting of unstable blunt trauma patients, not penetrating trauma patients. A FAST examination can show intraperitoneal free fluid. In addition, CT scan of the abdomen (Choice B) is an imaging modality that can elucidate the location and extent of penetrating injury and abdominal organs involved. A CT scan can provide more detail about specific injuries and the presence of free fluid than ultrasonography. However, this patient has a penetrating abdominal injury and is already hemodynamically unstable, so imaging should not delay exploratory laparotomy.

Laparoscopy (Choice C) would be indicated for abdominal trauma in stable patients with equivocal findings on a CT scan or diagnostic uncertainty. For a patient who is hemodynamically unstable, exploratory laparotomy is required to control hemorrhage and explore extent of the injury.

Diagnostic peritoneal lavage (Choice D) involves aspiration of peritoneal contents, infusing sterile saline into the peritoneal cavity, and analyzing the effluent. If blood, food particles, bile, bilirubin, amylase, or alkaline phosphatase are found, exploratory laparotomy is indicated as the presence of these findings suggests hollow or solid viscus injury. This patient is already hemodynamically unstable with a penetrating abdominal injury, so exploratory laparotomy is the next appropriate step.

Educational Objective: Penetrating abdominal trauma can present with abdominal tenderness and, if severe, hemodynamic instability from large volume hemoperitoneum. Exploratory laparotomy is required to control bleeding in hemodynamically unstable patients.



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2. A 5-year-old boy is brought to the physician for a well-child examination. His mother says that he plays outside frequently, and she has been having trouble keeping him away from the poison ivy in their backyard. Examination shows no abnormalities. His mother asks what can be done to prevent a rash after exposure to poison ivy. Which of the following is the most appropriate recommendation after exposure?

- ☒ A) Bathing with soap
- ☐ B) Topical antihistamine therapy
- ☐ C) Topical corticosteroid therapy
- ☐ D) Oral corticosteroid therapy
- ☐ E) No further recommendations are indicated

Correct Answer: A.

Bathing with soap is the most appropriate recommendation for patients following poison ivy exposure. Poison ivy, poison oak, and poison sumac are members of the *Toxicodendron* family that cause allergic contact dermatitis, known as rhus dermatitis. The contact allergen, urushiol, is released when the plant is damaged and exposure to the skin triggers a type IV hypersensitivity reaction within hours to days. Rhus dermatitis clinically manifests as well-defined, geometric or linear, eczematous patches with overlying vesicles in areas where the plant has come into contact with the skin. It commonly spreads to the face or genitals as the result of secondary contact. For patients with exposure, bathing with soap and water is recommended in addition to washing any clothing that has come into contact with poison ivy. Rhus dermatitis can persist for weeks following development and is treated with topical corticosteroids in mild to moderate cases and oral corticosteroids in severe cases.

Incorrect Answers: B, C, D, and E.

Topical antihistamine therapy (Choice B) is used for symptomatic treatment of itching in rhus dermatitis. Rhus dermatitis typically develops within hours to days of exposure. The next step after exposure would be for the patient to bathe with soap and water, as well as wash any affected clothing to prevent spread of the toxin.

Topical corticosteroid therapy (Choice C) and oral corticosteroid therapy (Choice D) are used for the treatment of rhus dermatitis. Topical corticosteroids decrease



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Correct Answer: A.

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Incorrect Answers: B, C, D, and E.

Topical antihistamine therapy (Choice B) is used for symptomatic treatment of itching in rhus dermatitis. Rhus dermatitis typically develops within hours to days of exposure. The next step after exposure would be for the patient to bathe with soap and water, as well as wash any affected clothing to prevent spread of the toxin.

Topical corticosteroid therapy (Choice C) and oral corticosteroid therapy (Choice D) are used for the treatment of rhus dermatitis. Topical corticosteroids decrease inflammation associated with the type IV hypersensitivity reaction following exposure to urushiol. While topical and systemic corticosteroids are used in the treatment of rhus dermatitis, patients should bathe following exposure to prevent spread of the rash.

No further recommendations are indicated (Choice E) is incorrect. Rhus dermatitis develops as the result of a type IV hypersensitivity reaction against urushiol found in poison ivy. In patients who do not wash skin or exposed clothing, the risk for spreading the rash to other locations exists.

Educational Objective: Rhus dermatitis is the result of a type IV hypersensitivity reaction to urushiol, found in the poison ivy plant. Patients are recommended to wash the skin with soap and water and wash affected clothing after exposure to poison ivy. Rhus dermatitis usually presents with linear to geometric, eczematous patches with overlying vesicles. Prevention/limiting exposure is the mainstay of treatment. Treatment may require topical or systemic corticosteroids.



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- ✓ 3. Six hours after beginning dicloxacillin therapy for cellulitis of the right lower extremity, a 37-year-old woman comes to the emergency department because of a 3-hour history of pruritic rash, dyspnea, and mild cough. She has a history of childhood asthma but no history of adverse reactions to medication. Six months ago, she had streptococcal pharyngitis treated with penicillin. She has been otherwise healthy. Her temperature is 37.1°C (98.8°F), pulse is 110/min, respirations are 22/min, and blood pressure is 86/64 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 92%. Examination of the skin shows 1- to 2-cm areas of pink urticaria over the trunk and upper and lower extremities and a 3-cm, erythematous, mildly tender area over the distal right lower extremity. Air movement is poor, and inspiratory and expiratory wheezes are heard on auscultation. Her hemoglobin concentration is 13.1 g/dL, and leukocyte count is 9500/mm³. A chest x-ray shows no abnormalities. Which of the following is most likely to prevent recurrence of this patient's symptoms?
- ☒ A) Avoidance of β -lactam antibiotics
 - ☐ B) Diphenhydramine prophylaxis
 - ☐ C) Prednisone prophylaxis for 4 weeks
 - ☐ D) Self-injectable epinephrine
 - ☐ E) Stanazolol prophylaxis daily

Correct Answer: A.

An anaphylactic reaction is a hypersensitivity reaction to an exogenous factor, most commonly medications, foods, or insect stings. It is mediated by activation of IgE, which leads to the release of histamine and other cytokines from mast cells and basophils. This subsequently leads to acute inflammation and profound vasodilation in multiple organ systems, generally the cardiovascular, respiratory, gastrointestinal, and integumentary systems. Symptoms include the rapid onset of bronchospasm with dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. When severe and untreated, it can progress to circulatory collapse with cardiovascular arrest or death as a result of asphyxiation and airway obstruction. Treatment includes the administration of epinephrine, antihistamines, bronchodilators, and glucocorticoids, as well as intravenous fluids. Severe cases may require endotracheal intubation and the administration of vasopressors. Patients with a history of atopy, such as asthma and eczema, and a history of medication allergies are at increased risk for anaphylaxis. This patient has a history of treatment with penicillin and may have developed a hypersensitivity to dicloxacillin, so avoidance of these and other antibiotics in the β -lactam family is most likely to prevent recurrence of her symptoms.

An anaphylactic reaction is a hypersensitivity reaction to an exogenous factor, most commonly medications, foods, or insect stings. It is mediated by activation of IgE, which leads to the release of histamine and other cytokines from mast cells and basophils. This subsequently leads to acute inflammation and profound vasodilation in multiple organ systems, generally the cardiovascular, respiratory, gastrointestinal, and integumentary systems. Symptoms include the rapid onset of bronchospasm with dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. When severe and untreated, it can progress to circulatory collapse with cardiovascular arrest or death as a result of asphyxiation and airway obstruction. Treatment includes the administration of epinephrine, antihistamines, bronchodilators, and glucocorticoids, as well as intravenous fluids. Severe cases may require endotracheal intubation and the administration of vasopressors. Patients with a history of atopy, such as asthma and eczema, and a history of medication allergies are at increased risk for anaphylaxis. This patient has a history of treatment with penicillin and may have developed a hypersensitivity to dicloxacillin, so avoidance of these and other antibiotics in the β -lactam family is most likely to prevent recurrence of her symptoms.

Incorrect Answers: B, C, D, and E.

Diphenhydramine prophylaxis (Choice B) is not the most appropriate answer. The most likely method to prevent future allergic reactions would be avoidance of β -lactam antibiotics.

Prednisone prophylaxis for 4 weeks (Choice C) is not the most likely method to prevent future allergic reactions. Avoiding β -lactam antibiotics is more likely to prevent these symptoms from recurring.

Self-injectable epinephrine (Choice D) is indicated for the treatment of anaphylaxis. However, avoidance of β -lactam antibiotics would be most likely to prevent future recurrence of this patient's symptoms.

Stanozolol prophylaxis daily (Choice E) may be a reasonable treatment option in cases of hereditary angioedema. The patient in this case is likely having an allergic reaction to dicloxacillin, which is part of the β -lactam antibiotic family.

Educational Objective: Anaphylaxis is an IgE-mediated hypersensitivity reaction that leads to extensive degranulation of mast cells and basophils, which results in acute multisystem inflammation and vasodilation. Symptoms include bronchospasm with associated dyspnea or wheezing, urticaria, flushing, nausea and emesis, edematous lips and tongue, and hypotension with tachycardia. Patients with a history of atopy, such as asthma and eczema, and a history of medication allergies are at increased risk for anaphylaxis. For a patient who has developed hypersensitivity to β -lactam antibiotics, avoidance of these antibiotics is the most likely way to prevent future allergic reactions.



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- ✓ 4. A 27-year-old woman is brought to the emergency department by her parents because of a 3-day history of auditory hallucinations. One week ago, her husband was convicted of a drug-dealing charge. At that time, she learned that she and her 16-month-old son may be at risk for violence from former associates of her husband. After leaving the courthouse, she remembers hearing a voice telling her to jump in front of a red car. Since that time, she has heard other voices; they appear more often when she is under stress. She says the voices are telling her that she is in danger and that she should hide. She has no history of psychiatric illness. She does not drink alcohol or use illicit drugs. Physical examination shows no abnormalities. On mental status examination, she is calm and cooperative but seems mildly suspicious of the physician. Her thought process is organized. She becomes tearful when questioned about her husband. She says she does not want to be hospitalized because her baby needs her. She is worried that the hospital may try to take him away. She says that she hears frightening voices but that they have not told her to harm herself again since the first day she experienced them. Her parents are also worried about the patient being separated from her son and say they can plan for someone to be with her at all times. Which of the following is the most appropriate next step in management?
- ☐ A) Cognitive behavioral therapy
 - ☐ B) Lithium carbonate therapy
 - ☐ C) Lorazepam therapy
 - ☒ D) Risperidone therapy
 - ☐ E) Sertraline therapy

Correct Answer: D.

This patient meets the diagnostic criteria for brief psychotic disorder. Brief psychotic disorder is characterized by the acute onset of one or more psychotic symptoms (eg, delusions, hallucinations, disorganized speech, disorganized behavior) lasting less than 1 month. This patient is experiencing paranoid delusions and auditory hallucinations. Risk factors for brief psychotic disorder include stressful life events and history of personality disorders. Treatment may include hospitalization and antipsychotic treatment (eg, risperidone therapy) depending on symptom severity and functional impairment, though some symptoms or the entire presentation may resolve without medications.

Incorrect Answers: A, B, C, and E.

☒ D) Risperidone therapy

☐ E) Sertraline therapy

Correct Answer: D.

This patient meets the diagnostic criteria for brief psychotic disorder. Brief psychotic disorder is characterized by the acute onset of one or more psychotic symptoms (eg, delusions, hallucinations, disorganized speech, disorganized behavior) lasting less than 1 month. This patient is experiencing paranoid delusions and auditory hallucinations. Risk factors for brief psychotic disorder include stressful life events and history of personality disorders. Treatment may include hospitalization and antipsychotic treatment (eg, risperidone therapy) depending on symptom severity and functional impairment, though some symptoms or the entire presentation may resolve without medications.

Incorrect Answers: A, B, C, and E.

Cognitive behavioral therapy (Choice A) is a long-term psychotherapeutic treatment that commonly helps patients with chronic psychotic disorders reframe and cope with their auditory hallucinations or delusions. The full treatment effect occurs over several months. It is unclear whether this patient's psychotic symptoms will persist long enough to benefit from cognitive behavioral therapy.

Lithium carbonate (Choice B) is a mood stabilizer used in the treatment of bipolar disorder. It is ineffective in treating isolated psychotic symptoms in the absence of mood symptoms. This patient does not demonstrate mood changes or changes in neurovegetative symptoms consistent with mania or depression.

Lorazepam (Choice C) is a benzodiazepine used for acute anxiety, alcohol withdrawal, and seizures. It does not directly affect psychotic symptoms. An antipsychotic medication such as risperidone is more likely to improve this patient's delusions and hallucinations.

Sertraline (Choice E) is a selective serotonin reuptake inhibitor used in the treatment of depressive and anxiety disorders. It is less likely to be effective for this patient's psychotic symptoms. Additionally, sertraline typically takes weeks to take effect. It is unclear whether this patient's psychotic symptoms will persist across multiple weeks.

Educational Objective: Brief psychotic disorder is characterized by at least one acute psychotic symptom (eg, delusions, hallucinations, disorganized speech, disorganized behavior) lasting less than 1 month. Treatment may include hospitalization and antipsychotic treatment (eg, risperidone therapy) depending on symptom severity and functional impairment, though some symptoms or the entire presentation may resolve without medications.



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- ✓ 5. A 62-year-old woman with pancreatic cancer metastatic to the liver comes to the physician because of use of mild to moderate abdominal pain for 2 days. She currently takes no pain medications. She says that her pain has increased from 0 to 2 on a 10-point scale. Which of the following is the most appropriate initial pharmacotherapy for her pain?

☒ A) Acetaminophen

☐ B) Codeine

☐ C) Fentanyl

☐ D) Methadone

☐ E) Morphine

Correct Answer: A.

Mild to moderate cancer pain commonly responds to over-the-counter pain medications, such as aspirin, acetaminophen, and ibuprofen. Nonopioids are not addictive and are less likely to lead to delirium compared with opioids. Attention to hepatic dosing of acetaminophen is needed for patients with liver disease. For refractory mild to moderate cancer pain and cancer pain in the moderate to severe range, opioids are preferred. For refractory mild to moderate pain, a mild opioid (eg, tramadol, codeine) with adjuvant nonopioid medication is commonly used. For moderate to severe pain, strong opioids (eg, morphine, hydromorphone, fentanyl, methadone, oxycodone) are typically used.

Incorrect Answers: B, C, D, and E.

Codeine (Choice B), a mild opioid, is typically reserved for refractory mild to moderate cancer pain.

Fentanyl (Choice C), methadone (Choice D), and morphine (Choice E) are strong opioids that are typically used for moderate to severe cancer pain.

Educational Objective: Mild to moderate cancer pain commonly responds to over-the-counter pain medications, such as aspirin, acetaminophen, and ibuprofen. For refractory mild to moderate cancer pain and cancer pain in the moderate to severe range, opioids are preferred.



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✓ 6. A 32-year-old nulligravid woman comes to the physician with her husband because she has been unable to conceive for 2 years. The couple has sexual intercourse without contraception approximately three times weekly. Menses occur at irregular 25- to 35-day intervals. Her last menstrual period was 3 weeks ago. She is otherwise healthy and takes no medications. Physical examination, including pelvic examination, shows no abnormalities. Serum studies show:

Thyroid-stimulating hormone	1.2 µU/mL
Prolactin	14 ng/mL
Progesterone	0.5 ng/mL (menstrual cycle day 21: follicular N<3; luteal N>3–5)

Semen analysis shows:

Count	36 million/mL (N>20)
Motility	65% (N>60%)

Hysterosalpingography shows bilateral tubal patency. Which of the following is the most likely cause of this patient's infertility?

- ☒ A) Anovulation
- ☐ B) Cervical stenosis
- ☐ C) Endometriosis
- ☐ D) Male factor
- ☐ E) Unexplained infertility

Correct Answer: A.

This patient's infertility is likely related to anovulation. Infertility is defined as the lack of conception with 1 year of unprotected sex in a woman under 35 years of age or with 6 months of unprotected sex in a woman aged 35 years or older. Evaluation of infertility should initially include a thorough history to elucidate details regarding the patient's menstrual and obstetric-gynecologic history, sexual practices, family history, and lifestyle factors that may impair fertility, along with appropriate evaluation of the patient's

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Incorrect Answers: B, C, D, and E.

Cervical stenosis (Choice B), narrowing of the cervical os at the entrance to the uterus, can cause symptoms such as pelvic pain and hypomenorrhea/amenorrhea. If the os is completely stenosed, it would result in blood accumulating in the uterus. Cervical stenosis would be shown on hysterosalpingography.

Endometriosis (Choice C) refers to the implantation of ectopic endometrial glands and stroma outside of the uterus. Symptoms commonly include dysmenorrhea, dyspareunia, dyschezia, and infertility. This patient does not present with these other symptoms.

Male factor (Choice D) is not the likely cause of this patient's infertility, as the sperm analysis shows normal count and motility. When evaluating for infertility, the male patient should undergo sperm analysis to assess male-related factors resulting in infertility.

Unexplained infertility (Choice E) would refer to persistent infertility of unknown cause after detailed evaluation. This patient's infertility is likely related to anovulation.

Educational Objective: Infertility is defined as the lack of conception with 1 year of unprotected sex in a woman under 35 years of age or with 6 months of unprotected sex in a woman aged 35 years or older. Evaluation of infertility should initially include a thorough history to elucidate details regarding the patient's menstrual and obstetric-gynecologic history, sexual practices, family history, and lifestyle factors that may impair fertility, along with appropriate evaluation of the patient's partner and sperm analysis. Anovulation can be caused by pregnancy, polycystic ovary syndrome, abnormalities or immaturity of the hypothalamic-pituitary-ovarian axis, menopause or premature ovarian failure, inadequate nutrition, chromosomal abnormalities, and thyroid disorders.



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✓ 7. A previously healthy 4-month-old boy is brought to the physician because of a 2-day history of fever and episodes of vomiting and crying. He is fussy but consolable. His temperature is 39.1°C (102.4°F), pulse is 142/min, respirations are 28/min, and blood pressure is 88/54 mm Hg. On examination, the left testicle is not palpable in the scrotal sac. Laboratory studies show:

Hematocrit	35%
Leukocyte count	19,500/mm ³
Platelet count	250,000/mm ³
Urine	
RBC	10/hpf
WBC	30/hpf

A Gram stain of a catheterized urine sample shows gram-negative rods. Urine and blood cultures are pending. Which of the following is the most likely underlying cause of these abnormal laboratory findings?

- ☐ A) Cryptorchidism
- ☐ B) Immunodeficiency
- ☒ C) Posterior urethral valves
- ☐ D) Renal calculi
- ☐ E) Renal vein thrombosis

Correct Answer: C.

Congenital urinary tract abnormalities include, but are not limited to, unilateral renal agenesis, fused kidneys, ureteral stricture and stenosis, duplex collecting system, posterior urethral valves, bladder agenesis, bladder exstrophy, hypo- or epispadias, and urethral strictures. Posterior urethral valves are formed from an abnormal remnant of the mesonephric (wolffian) ducts and can result in urinary tract obstruction and infection. Definitive diagnosis of posterior urethral valves is made with voiding cystourethrography showing dilation, elongation, and tapering of the urethra. Treatment is with endoscopic valve ablation in addition to antibiotics to treat any associated

- ☐ D) Renal calculi
- ☐ E) Renal vein thrombosis

Correct Answer: C.

Congenital urinary tract abnormalities include, but are not limited to, unilateral renal agenesis, fused kidneys, ureteral stricture and stenosis, duplex collecting system, posterior urethral valves, bladder agenesis, bladder exstrophy, hypo- or epispadias, and urethral strictures. Posterior urethral valves are formed from an abnormal remnant of the mesonephric (wolffian) ducts and can result in urinary tract obstruction and infection. Definitive diagnosis of posterior urethral valves is made with voiding cystourethrography showing dilation, elongation, and tapering of the urethra. Treatment is with endoscopic valve ablation in addition to antibiotics to treat any associated infection. This patient's laboratory findings are consistent with infection and are notable for leukocytosis, microscopic hematuria, and pyuria.

Incorrect Answers: A, B, D, and E.

Cryptorchidism (Choice A) is present on this patient's examination but is not the most likely underlying cause of the abnormal laboratory findings. Many infants are born with cryptorchidism, and in many, the testis spontaneously descends within the first few months of life. Cryptorchidism is associated with a risk for infertility and testicular cancer but is not associated with direct risk for urinary tract infections (UTIs) unless present as part of a congenital urinary tract anomaly.

Immunodeficiency (Choice B) may explain frequent, recurrent, or opportunistic infections in a child. In this case, the patient presents with one UTI, as opposed to a pattern of multiple or recurrent infections. Primary immunodeficiency is less likely to explain this presentation.

Renal calculi (Choice D) generally present with flank, abdominal, and pelvic pain that is colicky. There may be associated hematuria. Pyuria would not be present unless concomitant infection were present. A UTI from posterior urethral valves more likely explains this presentation.

Renal vein thrombosis (Choice E) may present with flank pain and hematuria, often occurring in a patient with innate or acquired thrombophilia. Pyuria would be less likely, and Gram stain of urine would be expected to be normal.

Educational Objective: Posterior urethral valves are formed from an abnormal remnant of the mesonephric (wolffian) ducts and can result in urinary tract obstruction or infection. Treatment is with endoscopic valve ablation in addition to antibiotics to treat any associated infection.



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- ✗ 8. A previously healthy 57-year-old man comes to the physician because of a 2-month history of increasing left foot pain at rest. He has smoked two packs of cigarettes daily for 30 years. Left popliteal and pedal pulses cannot be palpated. The foot is cool, and dependent rubor is noted. Arteriography shows occlusion of the left superficial femoral artery and stenosis of the left profunda femoris artery. Arterial bypass graft is scheduled. The patient is at greatest risk for development of which of the following postoperative complications?
- ☐ A) Cerebral infarction
 - ☐ B) Ischemic colitis
 - ☒ C) Myocardial infarction
 - ☐ D) Pneumonia
 - ☐ E) Renal failure

Correct Answer: C.

This patient presents with subacute foot pain at rest and has examination findings of limited pulses and rubor consistent with progressively worsening, now limb-threatening, ischemia. There are several complications that can occur following surgical revascularization by arterial bypass. These include, but are not limited to, direct surgical site and procedural complications such as infection, hematoma, graft occlusion, and nerve injury, and indirect complications such as pneumonia, cerebrovascular accidents, and myocardial infarctions. Most patients with peripheral artery disease also have atherosclerotic arterial disease within cerebral and cardiac circulation, increasing their risk for stroke and myocardial infarction. The PREVENT trial investigated complications in patients undergoing limb salvage bypass, and found that within 30 days post-procedure, 4.7% of patients experienced a myocardial infarction, whereas only 1.4% experienced a transient ischemic attack or stroke. There are multiple potential explanations for this difference, with the most likely reason being the relative lack of collateral circulation to the myocardium compared to the circle of Willis perfusion of the brain parenchyma. Because of the often robust collateral circulation to the brain anatomically, patients with atherosclerotic vascular disease have a relatively increased life-long risk for a myocardial event versus a cerebrovascular event, although both are higher than the general population. Further, there is increased demand on the heart during (from blood loss among other causes) and following vascular bypass surgery because of the revascularization and increased flow necessitating increased cardiac output. This stress on the heart increases the risk for cardiac complications. This patient is at greatest risk for myocardial infarction due to existence of atherosclerotic cardiovascular disease, plus the hemodynamic effect of his surgery.

Incorrect Answers: A, B, D, and E



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increasing their risk for stroke and myocardial infarction. The PREVENT trial investigated complications in patients undergoing limb salvage bypass, and found that within 30 days post-procedure, 4.7% of patients experienced a myocardial infarction, whereas only 1.4% experienced a transient ischemic attack or stroke. There are multiple potential explanations for this difference, with the most likely reason being the relative lack of collateral circulation to the myocardium compared to the circle of Willis perfusion of the brain parenchyma. Because of the often robust collateral circulation to the brain anatomically, patients with atherosclerotic vascular disease have a relatively increased life-long risk for a myocardial event versus a cerebrovascular event, although both are higher than the general population. Further, there is increased demand on the heart during (from blood loss among other causes) and following vascular bypass surgery because of the revascularization and increased flow necessitating increased cardiac output. This stress on the heart increases the risk for cardiac complications. This patient is at greatest risk for myocardial infarction due to existence of atherosclerotic cardiovascular disease, plus the hemodynamic effect of his surgery.

Incorrect Answers: A, B, D, and E.

Cerebral infarction (Choice A) is a known complication of vascular bypass, though it occurs less frequently and is therefore a lower risk than myocardial infarction.

Ischemic colitis (Choice B) is a known complication of arterial surgery, though it more commonly presents after vascular surgeries involving the aorta or the roots of the arteries supplying the colon. Watershed infarctions can also occur if a patient becomes hypotensive during surgery.

Pneumonia (Choice D) is a potential complication of multiple surgeries as a result of bacterial inoculation during intubation and mechanical ventilation. Additionally, limited chest excursion and coughing can cause atelectasis and decreased pulmonary bacterial clearance. This patient is at risk for myocardial infarction as a result of atherosclerotic cardiovascular disease along with hemodynamic effects of bypass surgery causing myocardial stress. The American College of Surgeons Risk Calculator, based on a bypass surgery with mild systemic disease, predicts a pneumonia risk of 0.4%.

Renal failure (Choice E) is a known complication of vascular bypass, because of the frequent existence of baseline chronic kidney disease, hypotension during surgery, and nephrotoxicity from intra-arterial contrast dye. This patient is at risk for myocardial infarction due to atherosclerotic cardiovascular disease along with hemodynamic effects of bypass surgery causing myocardial stress. The American College of Surgeons Risk Calculator, based on a bypass surgery with mild systemic disease, predicts a renal failure risk of 0.2%.

Educational Objective: Peripheral arterial disease presents with limb pain on exertion or at rest, diminished pulses, and rubor. Complications of bypass surgery include myocardial infarction, cerebrovascular accidents, renal failure or injury, and pneumonia, among others. Myocardial infarction risk is increased because of existing atherosclerotic cardiovascular disease, the potential for blood loss, and the postsurgical demand for increased cardiac output.



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9. A 17-year-old primigravid patient at 38 weeks' gestation is admitted to the hospital in labor. Contractions have occurred for 2 hours every 2 to 3 minutes. Her pregnancy has been uncomplicated. A fetal heart tracing is shown. The cervix is 4 cm dilated and 90% effaced; the vertex is at 0 station. In addition to continued fetal monitoring, which of the following is the most appropriate next step in management?

- ☒ A) Observation only
- ☐ B) Biophysical profile
- ☐ C) Doppler ultrasonography of the umbilical artery
- ☐ D) Fetal scalp sampling
- ☐ E) Cesarean delivery

Correct Answer: A.

Labor consists of three defined stages. The first stage is divided into latent and active labor and encompasses the start of labor (contractions and cervical change) until the completion of cervical dilation and effacement. The second stage includes the time from complete cervical dilation to the delivery of the fetus, and the third stage contains the delivery of the placenta. This patient presents with a term pregnancy in labor, with contractions and fetal heart tracings that are reassuring. The fetal heart tracing shows spontaneous accelerations, along with appropriate heart rate and variability. There are no signs of concerning deceleration to suggest inappropriate fetal distress. As well, this patient appears to be progressing in labor adequately, with her cervix dilated to 4 cm and 90% effaced. Because of the apparent normal progression of labor in this patient, fetal monitoring should be continued along with observation of the patient. Further, invasive studies are not necessary at this time.

Incorrect Answers: B, C, D, and E.

Biophysical profile (Choice B) refers to the assessment of four biophysical variables of the fetus in high-risk pregnancies through ultrasonography. These variables are fetal tone, fetal breathing movements, fetal gross body movement, and amniotic fluid volume. Each variable is assigned a score of 0 or 2 points, and these are assessed over the course of 30 minutes of continuous observation. This patient has had an uncomplicated pregnancy, making observation the most appropriate next step at this time.

Doppler ultrasonography of the umbilical artery (Choice C) can be used to evaluate fetal well-being in the third trimester. Abnormal Doppler evaluation may suggest placental insufficiency. This patient is in labor, and Doppler evaluation of the umbilical artery is unnecessary.



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Correct Answer: A.

Labor consists of three defined stages. The first stage is divided into latent and active labor and encompasses the start of labor (contractions and cervical change) until the completion of cervical dilation and effacement. The second stage includes the time from complete cervical dilation to the delivery of the fetus, and the third stage contains the delivery of the placenta. This patient presents with a term pregnancy in labor, with contractions and fetal heart tracings that are reassuring. The fetal heart tracing shows spontaneous accelerations, along with appropriate heart rate and variability. There are no signs of concerning deceleration to suggest inappropriate fetal distress. As well, this patient appears to be progressing in labor adequately, with her cervix dilated to 4 cm and 90% effaced. Because of the apparent normal progression of labor in this patient, fetal monitoring should be continued along with observation of the patient. Further, invasive studies are not necessary at this time.

Incorrect Answers: B, C, D, and E.

Biophysical profile (Choice B) refers to the assessment of four biophysical variables of the fetus in high-risk pregnancies through ultrasonography. These variables are fetal tone, fetal breathing movements, fetal gross body movement, and amniotic fluid volume. Each variable is assigned a score of 0 or 2 points, and these are assessed over the course of 30 minutes of continuous observation. This patient has had an uncomplicated pregnancy, making observation the most appropriate next step at this time.

Doppler ultrasonography of the umbilical artery (Choice C) can be used to evaluate fetal well-being in the third trimester. Abnormal Doppler evaluation may suggest placental insufficiency. This patient is in labor, and Doppler evaluation of the umbilical artery is unnecessary.

Fetal scalp sampling (Choice D) is an invasive form of fetal monitoring whereby a blood sample is taken from a fetal scalp vein to assess pH and oxygenation. This patient is currently showing no sign of distress, and this invasive test is not indicated.

Cesarean delivery (Choice E) is not necessary for this patient with normal fetal heart tracings. While there are a variety of indications for cesarean delivery, including fetal and/or maternal distress, this patient's labor is proceeding normally, with no signs of fetal or maternal instability.

Educational Objective: Labor consists of three defined stages. The first stage is divided into latent and active labor and encompasses the start of labor (contractions and cervical change) until the completion of cervical dilation and effacement. The second stage includes the time from complete cervical dilation to the delivery of the fetus, and the third stage contains the delivery of the placenta. For a patient with a reassuring clinical status and fetal heart tracings, continued fetal heart monitoring and observation are recommended.



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10. A 77-year-old man comes to the physician 24 hours after the gradual onset of mild shortness of breath. He has alcohol-induced cirrhosis treated with furosemide, spironolactone, and a potassium supplement, but he says that he ran out of his medications last week. Since then, he has noticed progressive swelling of his feet and increased abdominal girth. There is no other history of serious illness. He is uncomfortable and in mild respiratory distress. He appears cachectic. His pulse is 82/min, respirations are 14/min, and blood pressure is 102/74 mm Hg. Cardiopulmonary examination shows no abnormalities. Abdominal examination shows severe distention. The liver is not palpated. There is 2+ pedal edema bilaterally. Serum studies show:

Na ⁺	126 mEq/L
K ⁺	3.9 mEq/L
Cl ⁻	96 mEq/L
HCO ₃ ⁻	26 mEq/L
Urea nitrogen	18 mg/dL
Creatinine	1.3 mg/dL
Albumin	1.6 g/dL

Which of the following is most likely to be decreased in this patient?

- ☐ A) Serum ADH (vasopressin)
- ☐ B) Serum aldosterone
- ☐ C) Serum angiotensin
- ☐ D) Total body water
- ☒ E) Urine sodium

Correct Answer: E.



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- ☐ C) Serum angiotensin
- ☐ D) Total body water
- ☒ E) Urine sodium

Correct Answer: E.

This patient, with a history of cirrhosis, hypoalbuminemia, hyponatremia, and hypervolemia, most likely has a decreased urine sodium concentration. Hyponatremia has many causes and mechanisms of occurrence. In this case, the decreased concentration of serum albumin results in third-spacing of fluid due to loss of oncotic pressure. This results in decreased intravascular volume occurring simultaneously with increased total-body fluid volume. The decreased intravascular volume results in decreased effective circulating volume delivery to the kidney. The kidney uptakes filtered solute to a greater extent when faced with low effective circulating volume due to inappropriate signaling, which suggests impaired perfusion and hypovolemia. Increased activation of the renin-angiotensin-aldosterone system (RAAS) results in increased uptake of filtered sodium with resultingly decreased urine sodium and increased serum ADH (vasopressin), aldosterone, angiotensin, and total body water.

Incorrect Answers: A, B, C, and D.

In cases of decreased renal effective circulating volume (eg, cirrhosis, nephrotic syndrome, congestive heart failure), the RAAS activates to increase serum ADH (vasopressin) (Choice A), serum aldosterone (Choice B), and serum angiotensin (Choice C). The net effect of the composite set of hormones in cases of decreased effective circulating volume is increased renal absorption of sodium, with resultingly decreased urine sodium. Total body water (Choice D) is increased due to accumulation in extravascular spaces (third-spacing) and decreased renal excretion of water. By contrast, syndrome of inappropriate ADH results in greater amounts of water reclaimed by the kidney without similar or increased uptake of sodium, leading to higher urine sodium concentration in comparison.

Educational Objective: Hypervolemic states (eg, cirrhosis, nephrotic syndrome, heart failure) result in decreased effective circulating blood volume, leading to activation of the renin-angiotensin-aldosterone system. The effect of increased renin, angiotensin, aldosterone, and ADH (vasopressin) on the kidney results in fluid retention and decreased urine sodium concentration. Syndrome of inappropriate ADH in isolation otherwise results in increased urine sodium concentration.



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✓ 11. A 2½-year-old girl is brought to the physician for a well-child examination. She was born at term following an uncomplicated pregnancy and has no history of serious illness. She can climb steps, throw a ball overhand, and build a tower of six blocks. She is beginning to dress herself. She uses two-word sentences. She is shy around strangers. She participates in interactive play in day care. Examination shows no abnormalities. Which of the following is the most accurate assessment of this child's development?

	Fine Motor Development	Gross Motor Development	Language Development	Social Development
<input type="radio"/> A)	Delayed	delayed	delayed	delayed
<input type="radio"/> B)	Delayed	delayed	normal	normal
<input type="radio"/> C)	Delayed	normal	delayed	delayed
<input type="radio"/> D)	Delayed	normal	normal	normal
<input type="radio"/> E)	Normal	delayed	normal	normal
<input type="radio"/> F)	Normal	normal	delayed	normal
<input type="radio"/> G)	Normal	normal	normal	delayed
<input checked="" type="radio"/> H)	Normal	normal	normal	normal

Correct Answer: H.

This child is demonstrating age-appropriate behavior. Screening for developmental milestone achievement is an important element of well-child examinations. Gross motor, fine motor, cognitive, social, and language milestones should be evaluated. While there is a wide range of variability, most children by age 2½ years can climb stairs, stack blocks (usually an amount equal to the child's age in years times three), feed themselves using utensils, throw and kick balls, and are beginning to dress themselves. Children of this age will generally have a vocabulary of at least 200 words and will speak in two-word sentences. Socially, they begin to show signs of independence from their parents with behaviors such as distancing with reapproaching and engaging in interactive or parallel play with children of the same age.

Correct Answer: H.

This child is demonstrating age-appropriate behavior. Screening for developmental milestone achievement is an important element of well-child examinations. Gross motor, fine motor, cognitive, social, and language milestones should be evaluated. While there is a wide range of variability, most children by age 2½ years can climb stairs, stack blocks (usually an amount equal to the child's age in years times three), feed themselves using utensils, throw and kick balls, and are beginning to dress themselves. Children of this age will generally have a vocabulary of at least 200 words and will speak in two-word sentences. Socially, they begin to show signs of independence from their parents with behaviors such as distancing with reapproaching and engaging in interactive or parallel play with children of the same age.

Incorrect Answers: A, B, C, D, E, F, and G.

Fine motor skills appropriate for a 2½-year-old child include beginning to dress themselves, feeding themselves with utensils, and stacking blocks. This child demonstrates appropriate fine motor skills, making choices A, B, C, and D incorrect.

Gross motor skills appropriate for a 2½-year-old child include climbing steps and throwing or kicking balls. Some children may be able to use a tricycle by this age, though this generally occurs by age 3 years. This child demonstrates appropriate gross motor skills, making choices A, B, and E incorrect.

Language development appropriate for a 2½-year-old child includes using a vocabulary of around 200 words and speaking in two-word sentences. This child demonstrates appropriate language development, making choices A, C, and F incorrect.

Social development appropriate for a 2½-year-old child includes interactive and parallel play as well as signs of independence such as moving away from a parent and then returning to the parent. This child demonstrates appropriate social development, making choices A, C, and G incorrect.

Educational Objective: Most children by age 2½ years can climb stairs, stack six blocks, feed themselves using utensils, and throw and kick balls. They will generally have a vocabulary of at least 200 words and will speak in two-word sentences. They may show signs of independence from their parents with behaviors such as distancing with reapproaching and engaging in interactive or parallel play with children of the same age.



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- ✓ 12. A 57-year-old woman comes to the physician because of a 3-month history of intermittent nonproductive cough and shortness of breath with exertion and at night. She has not had fever or weight loss. She immigrated to the USA from Kenya 10 years ago. She has a 5-year history of hypertension controlled with losartan and hydrochlorothiazide. The patient is 168 cm (5 ft 6 in) tall and weighs 82 kg (180 lb); BMI is 29 kg/m². Her temperature is 37.2°C (99°F), pulse is 72/min and regular, respirations are 12/min, and blood pressure is 138/88 mm Hg. Jugular venous pulsations are present 3 cm above the sternal angle. Low-pitched expiratory wheezes are heard over the lungs posteriorly. A grade 2/6 systolic murmur is heard at the left sternal border and second intercostal space. A chest x-ray shows no abnormalities. Which of the following is the most likely diagnosis?
- ☐ A) Adverse effect of losartan
 - ☒ B) Asthma
 - ☐ C) Cystic fibrosis
 - ☐ D) Sarcoidosis
 - ☐ E) Tuberculosis

Correct Answer: B.

Asthma is characterized by reversible obstruction to airflow due to spasms of smooth muscle in the bronchi and small airways. It presents with episodic wheezing and shortness of breath with or without a cough. It may also present with an isolated cough. Patients in whom asthma is suspected should undergo spirometry with measurement of the forced expiratory volume in 1 second (FEV₁) and the forced vital capacity (FVC). Spirometry or pulmonary function testing will show an obstructive pattern, characterized by a decreased FEV₁, normal FVC, and increased total lung capacity. Since asthma is a reversible and episodic condition, results of spirometry are frequently normal unless the patient is exhibiting symptoms at or around the time of testing. Therefore, many patients undergo a methacholine challenge test. Methacholine is a potent stimulator of bronchoconstriction, and as asthma is defined by airway hyperreactivity, patients with asthma tend to experience bronchospasm at lower doses of methacholine than patients without asthma. An improvement in FEV₁ by at least 12% and 200 milliliters with subsequent bronchodilator administration is diagnostic of asthma. Treatment depends on the severity but may include short-acting bronchodilators and/or inhaled corticosteroids.

Incorrect Answers: A, C, D, and E.



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Asthma is characterized by reversible obstruction to airflow due to spasms of smooth muscle in the bronchi and small airways. It presents with episodic wheezing and shortness of breath with or without a cough. It may also present with an isolated cough. Patients in whom asthma is suspected should undergo spirometry with measurement of the forced expiratory volume in 1 second (FEV₁) and the forced vital capacity (FVC). Spirometry or pulmonary function testing will show an obstructive pattern, characterized by a decreased FEV₁, normal FVC, and increased total lung capacity. Since asthma is a reversible and episodic condition, results of spirometry are frequently normal unless the patient is exhibiting symptoms at or around the time of testing. Therefore, many patients undergo a methacholine challenge test. Methacholine is a potent stimulator of bronchoconstriction, and as asthma is defined by airway hyperreactivity, patients with asthma tend to experience bronchospasm at lower doses of methacholine than patients without asthma. An improvement in FEV₁ by at least 12% and 200 milliliters with subsequent bronchodilator administration is diagnostic of asthma. Treatment depends on the severity but may include short-acting bronchodilators and/or inhaled corticosteroids.

Incorrect Answers: A, C, D, and E.

Adverse effect of losartan (Choice A) would not be expected in this patient. While a nonproductive cough that is persistent in a patient on anti-hypertensive medications, particularly ACE inhibitors, can be seen, it would not generally be seen with an angiotensin II receptor blocking agent, such as losartan.

Cystic fibrosis (Choice C) is a syndrome resulting from defects in the *CFTR* gene, leading to a deficiency in a chloride channel that secretes chloride in the lungs and gastrointestinal tract and reabsorbs chloride in sweat glands. Characteristic findings include bronchiectasis, recurrent pulmonary infections, pancreatic insufficiency, diarrhea, malnutrition, and weight loss. It would generally be identified in children rather than adults.

Sarcoidosis (Choice D) is an autoimmune disorder that affects multiple body systems. Classically, it presents with cough and dyspnea as well as bilateral hilar lymphadenopathy due to noncaseating granulomatous inflammation. It can also present with anterior uveitis, cutaneous manifestations such as erythema nodosum, and arthralgias.

Tuberculosis (Choice E) primary infection presents with subacute fevers, weight loss, night sweats, cough, and malaise. Suspicion would be higher in endemic areas or for patients who have spent significant time in high-risk areas recently. Cavitory lesions would be expected on chest x-ray. This patient's remote history of living in Kenya without recent travel doesn't place her at significantly increased risk.

Educational Objective: Asthma is characterized by reversible obstruction to airflow due to spasm of smooth muscle in the bronchi and small airways, presenting with episodic wheezing and shortness of breath with or without a cough. It may also present with an isolated cough. Spirometry or pulmonary function testing during an exacerbation will show an obstructive pattern, characterized by a decreased one-second forced-expiratory volume, normal forced vital capacity, and increased total lung



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- ✓ 13. An asymptomatic 57-year-old man who is HIV positive comes to the physician as a new patient with his medical records. He currently takes no medications. He has a history of sexual activity with male and female partners but has been in a monogamous relationship with a woman for the past 2 years. His partner uses an oral contraceptive, and they do not use condoms. On questioning, he says his partner does not know about his HIV status, but that his previous physician "knew all about" this and said it was not a big deal." Examination today shows no abnormalities. Which of the following is the most appropriate next step?
- ☐ A) Contact the patient's previous physician for further information
 - ☐ B) Discontinue care until the patient tells his partner about his HIV status
 - ☐ C) Emphasize the importance of consistent use of condoms
 - ☒ D) Encourage the patient to tell his partner about his HIV status
 - ☐ E) Inform the partner of the patient's HIV status

Correct Answer: D.

If a patient has a transmissible disease such as HIV, the physician should first encourage the patient to share their disease status with others at risk for contracting the disease. Encouraging this disclosure promotes public health while protecting the patient's autonomy to choose to make this disclosure. However, in the United States, the physician is also required to report a patient's HIV positive status to local or state health departments. States' rules about informing partners about HIV status vary. Though some states require physicians to warn partners, others do not since this is a breach of confidentiality and may discourage patients from pursuing HIV testing. Regardless of state rules, the physician should first encourage this patient to disclose his HIV status to his partner.

Incorrect Answers: A, B, C, and E.

Contact the patient's previous physician for further information (Choice A) is not directly relevant to the current decision about disclosing the patient's HIV status.

Discontinue care until the patient tells his partner about his HIV status (Choice B) is a coercive, and thus unethical, strategy. Immediately discontinuing care also constitutes abandonment in that it does not give the patient time to locate a new physician. Abandonment is unethical and constitutes medical malpractice.



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- ☐ C) Emphasize the importance of consistent use of condoms
- ☒ D) Encourage the patient to tell his partner about his HIV status
- ☐ E) Inform the partner of the patient's HIV status

Correct Answer: D.

If a patient has a transmissible disease such as HIV, the physician should first encourage the patient to share their disease status with others at risk for contracting the disease. Encouraging this disclosure promotes public health while protecting the patient's autonomy to choose to make this disclosure. However, in the United States, the physician is also required to report a patient's HIV positive status to local or state health departments. States' rules about informing partners about HIV status vary. Though some states require physicians to warn partners, others do not since this is a breach of confidentiality and may discourage patients from pursuing HIV testing. Regardless of state rules, the physician should first encourage this patient to disclose his HIV status to his partner.

Incorrect Answers: A, B, C, and E.

Contact the patient's previous physician for further information (Choice A) is not directly relevant to the current decision about disclosing the patient's HIV status.

Discontinue care until the patient tells his partner about his HIV status (Choice B) is a coercive, and thus unethical, strategy. Immediately discontinuing care also constitutes abandonment in that it does not give the patient time to locate a new physician. Abandonment is unethical and constitutes medical malpractice.

Emphasize the importance of consistent use of condoms (Choice C) is appropriate, though condoms are not fully effective at preventing sexually transmitted infection transmission. This patient's partner should know of the risks of engaging in sexual contact with the patient so she can make an informed decision. Thus, encouraging condom use is less urgent than encouraging this patient to disclose his HIV status to his partner.

Inform the partner of the patient's HIV status (Choice E) is permissible in some states if the patient declines to inform her himself. However, to preserve this patient's autonomy in choosing to disclose his HIV status, the physician should first encourage him to initiate this discussion.

Educational Objective: If a patient is HIV positive, the physician should first encourage the patient to share their disease status with sexual partners. In some states, if the patient declines to disclose the HIV positive status, the physician may inform the partner.



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14. A 37-year-old woman, gravida 3, para 2, at 24 weeks' gestation comes to the physician 4 weeks after noticing a lump in her left breast during self-examination. There is no family history of cancer. She currently takes no medications. Examination shows a 1 × 2-cm, unilateral, dominant mass in the left breast. Examination of the right breast shows tissue changes of pregnancy and no evidence of a mass. Which of the following is the most appropriate next step in management?

- ☐ A) Reexamination after delivery
- ☐ B) MRI of the left breast after delivery
- ☐ C) Tamoxifen therapy immediately
- ☐ D) Biopsy of the mass after delivery
- ☒ E) Fine-needle aspiration of the mass immediately
- ☐ F) Recommendation of pregnancy termination

Correct Answer: E.

Breast masses may be benign or malignant. Benign lesions include fibroadenomas, galactoceles, fat necrosis, cysts, and abscesses, whereas the most common type of malignant lesion is invasive ductal carcinoma. Benign lesions are commonly well-circumscribed, mobile, and occasionally tender to palpation. In contrast, malignant lesions are often poorly defined, adherent to the chest wall, nontender, and associated with overlying skin changes, although these distinctions do not always hold true. Evaluation of a breast mass first involves imaging with either mammography, if over the age of 30, or ultrasonography, if under the age of 30 or pregnant, to evaluate whether the palpable mass has features consistent with breast cancer, such as a spiculated margin or irregular shape. Once a mass is confirmed on imaging with suspicion of possible cancer, histopathologic diagnosis is necessary to make appropriate treatment decisions for the patient regardless of whether the patient is pregnant. Therefore, a fine-needle aspiration or core biopsy should be obtained to appropriately characterize this patient's mass.

Incorrect Answers: A, B, C, D, and F.

Reexamination after delivery (Choice A), MRI of the left breast after delivery (Choice B), and biopsy of the mass after delivery (Choice D) would all result in an unacceptable delay in diagnosis for this patient. Once a mass is confirmed, the patient should undergo tissue sampling of that mass to confirm the histopathologic diagnosis. This will allow the clinician to make the appropriate treatment decision.



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☒ E) Fine-needle aspiration of the mass immediately☐ F) Recommendation of pregnancy termination

Correct Answer: E.

Breast masses may be benign or malignant. Benign lesions include fibroadenomas, galactoceles, fat necrosis, cysts, and abscesses, whereas the most common type of malignant lesion is invasive ductal carcinoma. Benign lesions are commonly well-circumscribed, mobile, and occasionally tender to palpation. In contrast, malignant lesions are often poorly defined, adherent to the chest wall, nontender, and associated with overlying skin changes, although these distinctions do not always hold true. Evaluation of a breast mass first involves imaging with either mammography, if over the age of 30, or ultrasonography, if under the age of 30 or pregnant, to evaluate whether the palpable mass has features consistent with breast cancer, such as a spiculated margin or irregular shape. Once a mass is confirmed on imaging with suspicion of possible cancer, histopathologic diagnosis is necessary to make appropriate treatment decisions for the patient regardless of whether the patient is pregnant. Therefore, a fine-needle aspiration or core biopsy should be obtained to appropriately characterize this patient's mass.

Incorrect Answers: A, B, C, D, and F.

Reexamination after delivery (Choice A), MRI of the left breast after delivery (Choice B), and biopsy of the mass after delivery (Choice D) would all result in an unacceptable delay in diagnosis for this patient. Once a mass is confirmed, the patient should undergo tissue sampling of that mass to confirm the histopathologic diagnosis. This will allow the clinician to make the appropriate treatment decision.

Tamoxifen therapy immediately (Choice C) is not necessary in this patient, as the histopathologic diagnosis has not been confirmed. Tamoxifen may be used in the setting of certain breast cancer subtypes; however, biopsy of the mass is first necessary to confirm the diagnosis.

Recommendation of pregnancy termination (Choice F) is unnecessary since the diagnosis of this mass has not yet been confirmed. The mass should first be biopsied to determine the diagnosis and appropriate management plan.

Educational Objective: Evaluation of a breast mass first involves imaging with either mammography, if over the age of 30, or ultrasonography, if under the age of 30 or pregnant, to evaluate whether the palpable mass has features consistent with breast cancer, such as a spiculated margin or irregular shape. Masses suspicious for malignancy merit histopathologic diagnosis regardless of pregnancy status.



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✓ 15. A previously healthy 47-year-old man is brought to the emergency department by his wife because of a 2-day history of increasing confusion. He thinks it is 1992 and often makes statements that do not make sense. He has not had recent weight loss or other symptoms. He has smoked two packs of cigarettes daily for 30 years. He is oriented to person and place but not to time. His temperature is 37°C (98.6°F), pulse is 80/min, respirations are 20/min, and blood pressure is 110/70 mm Hg. The remainder of the examination shows no abnormalities. Laboratory studies show a serum sodium concentration of 115 mEq/L, urine sodium concentration of 80 mEq/L, and urine osmolality of 600 mOsmol/kg H₂O. Which of the following is the most likely underlying cause of this patient's confusion?

- ☐ A) Adrenal insufficiency
- ☐ B) Cerebral salt wasting
- ☐ C) Diabetes insipidus
- ☐ D) Ectopic adrenocorticotrophic hormone production
- ☐ E) Hypovolemic hyponatremia
- ☒ F) Syndrome of inappropriate secretion of ADH (vasopressin)

Correct Answer: F.

This patient's altered mental status is likely due to hyponatremia secondary to the syndrome of inappropriate secretion of antidiuretic hormone (SIADH). While commonly presenting as a paraneoplastic syndrome (as is likely in this patient with a long smoking history), SIADH may also frequently present in association with sepsis, pneumonia, central nervous system trauma, following surgery, or as a medication adverse effect. SIADH results in increased aquaporin expression on the luminal surface of renal collecting duct cells, which increases the membrane permeability to water, leading to inappropriate free water reabsorption, hyponatremia, decreased serum osmolality, and inappropriately increased urine concentration. The diagnosis is confirmed by measurement of serum and urine osmolality and sodium concentration, confirmation of euvolemia, and exclusion of alternate causes of hyponatremia, such as hypothyroidism and adrenal insufficiency. The management of SIADH-associated hyponatremia involves treatment of the underlying disease, restriction of water intake, and gradual sodium correction. If there are associated severe neurologic symptoms, administration of hypertonic saline may be considered to correct the sodium concentration, although this must be performed with caution due to the risk for central pontine myelinolysis.



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This patient's altered mental status is likely due to hyponatremia secondary to the syndrome of inappropriate secretion of antidiuretic hormone (SIADH). While commonly presenting as a paraneoplastic syndrome (as is likely in this patient with a long smoking history), SIADH may also frequently present in association with sepsis, pneumonia, central nervous system trauma, following surgery, or as a medication adverse effect. SIADH results in increased aquaporin expression on the luminal surface of renal collecting duct cells, which increases the membrane permeability to water, leading to inappropriate free water reabsorption, hyponatremia, decreased serum osmolality, and inappropriately increased urine concentration. The diagnosis is confirmed by measurement of serum and urine osmolality and sodium concentration, confirmation of euvolemia, and exclusion of alternate causes of hyponatremia, such as hypothyroidism and adrenal insufficiency. The management of SIADH-associated hyponatremia involves treatment of the underlying disease, restriction of water intake, and gradual sodium correction. If there are associated severe neurologic symptoms, administration of hypertonic saline may be considered to correct the sodium concentration, although this must be performed with caution due to the risk for central pontine myelinolysis.

Incorrect Answers: A, B, C, D, and E.

Adrenal insufficiency (Choice A) typically presents with fatigue, nausea, fasting hypoglycemia, muscle weakness, and morning headache due to glucocorticoid insufficiency. Patients with primary adrenal insufficiency may also experience mineralocorticoid and androgen deficiency, which would present with urinary salt wasting and decreased body hair, respectively.

Cerebral salt wasting (Choice B) is a rare but potentially serious condition characterized by excessive urinary sodium loss and volume depletion in the setting of cerebral disease or injury, particularly involving the central nervous system. Given this patient's lack of central nervous system trauma history and his smoking history, cerebral salt wasting is unlikely.

Diabetes insipidus (Choice C) refers to a lack of antidiuretic hormone (central) or resistance to antidiuretic hormone (nephrogenic) leading to decreased free water reabsorption from collecting tubules. This results in polyuria along with a state of dehydration and hypernatremia.

Ectopic adrenocorticotrophic hormone production (Choice D) is not likely in this patient. Patients with ectopic adrenocorticotrophic hormone production will generally present with hypernatremia and hypokalemia, as the result of excess aldosterone production. This is not seen in this patient.

Hypovolemic hyponatremia (Choice E) would produce laboratory study results similar to those seen in this patient. However, it would not be expected that the patient has a regular heart rate or be normotensive in that setting. Additionally, given his smoking history, it is more likely that these laboratory study results are from a paraneoplastic SIADH due to an undetected lung malignancy.



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- ✓ 16. Forty-eight hours after spontaneous rupture of membranes, a 425-g (1-lb) newborn is delivered at 21 weeks' gestation to a 42-year-old primigravid woman. Her pregnancy had been uncomplicated, and her estimated date of delivery was confirmed by ultrasonography at 12 weeks' gestation. Chorionic villus sampling at 12 weeks' gestation showed a karyotype of 46,XY. The newborn's heart rate is 40/min, and a gasp is noted. On examination, the eyelids are fused, and the skin is transparent. Which of the following is the most appropriate next step in management of the newborn?

- ☒ A) Palliative care
- ☐ B) Inotropic therapy
- ☐ C) Placement of a urinary catheter
- ☐ D) Chest compressions
- ☐ E) Intubation and mechanical ventilation

Correct Answer: A.

This newborn is nonviable as indicated by being younger than 22 weeks' gestation, weighing less than 1 lb 1.5 oz, having clear (undeveloped) skin that is unlikely to serve as an effective barrier, having apnea of prematurity, and having fused eyelids. Traditionally, newborns are believed to have a chance of surviving at 24 weeks' gestation and later. Though rarely, newborns at 22 or 23 weeks' gestation survive, no reported premature newborn has survived at 21 weeks' gestation or earlier. Therefore, treatment of the newborn's medical problems is futile. In cases where no viable treatment is available, such as with this newborn, palliative care directed at comfort rather than prolonging life should be pursued. Palliative care focuses on relieving distressing symptoms, including those at the end of a patient's life.

Incorrect Answers: B, C, D, and E.

Inotropic therapy (Choice B), placement of a urinary catheter (Choice C), chest compressions (Choice D), and intubation and mechanical ventilation (Choice E) are all life-prolonging measures. Additionally, the placement of a urinary catheter, chest compressions, and intubation and mechanical ventilation are all invasive measures that are likely to cause discomfort. Given that further medical interventions will be futile, palliative care should be pursued.

Educational Objective: Extremely premature newborns (those born before 22 weeks' gestation) have no meaningful chance of surviving. In such cases when medical intervention is suspected to be futile, palliative care instead of life-prolonging care should be pursued.



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- ✓ 17. A 37-year-old man comes to the physician for a routine examination. He has no history of serious illness, has no known allergies, and takes no medications. His mother died of a brain neoplasm at the age of 60 years. His father is 86 years old and healthy. During the past 4 years, the patient has volunteered at a homeless shelter and has donated blood once every 2 months. He appears healthy. He is 178 cm (5 ft 10 in) tall and weighs 75 kg (165 lb); BMI is 24 kg/m². Vital signs are within normal limits. Examination shows no abnormalities. Laboratory studies show:

Hemoglobin	14.5 g/dL
Hematocrit	44%
Mean corpuscular hemoglobin concentration	30% Hb/cell
Mean corpuscular volume	90 μm ³
Leukocyte count	2600/mm ³
Segmented neutrophils	60%
Eosinophils	1%
Lymphocytes	35%
Monocytes	4%
Platelet count	250,000/mm ³

Results of fasting serum lipid studies are within the reference ranges. Which of the following is the most appropriate next step in management?

- ☒ A) Repeat complete blood count in 3 months
- ☐ B) Serum antineutrophil cytoplasmic autoantibody assay
- ☐ C) Serum bactericidal assay
- ☐ D) Ultrasonography of the spleen
- ☐ E) Bone marrow biopsy



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☐ E) Bone marrow biopsy

Correct Answer: A.

Neutropenia is defined as an absolute neutrophil count of less than 1500 cells/mm³. Benign familial neutropenia affects many individuals worldwide and may be observed in individuals of African, West Indian, as well as Middle Eastern descent. Patients with the condition are not at an increased risk for infection, despite having a neutrophil count of usually 1000 to 1500 cells/mm³. In individuals without other cytopenias, lymphadenopathy, or organomegaly, further evaluation is not required. Repeat complete blood count in 3 months would be the most appropriate next step in management for this otherwise healthy patient.

Incorrect Answers: B, C, D, and E.

Serum antineutrophil cytoplasmic autoantibody assay (Choice B) may be ordered when evaluating for conditions such as granulomatosis with polyangiitis, eosinophilic granulomatosis with polyangiitis, and microscopic polyangiitis. Because the patient in this case is healthy and young with identified leukopenia, the most appropriate next step in management is to repeat a complete blood count in 3 months.

Serum bactericidal assay (Choice C) may be used to assess antibody function and the complement system's ability to neutralize a pathogen. Repeat complete blood count in 3 months would be most appropriate for this patient.

Ultrasonography of the spleen (Choice D) may be completed if there is concern for splenomegaly contributing to the patient's identified leukopenia. Because the patient in this case is healthy and young, repeat complete blood count in 3 months would be most appropriate.

Bone marrow biopsy (Choice E) may be used to evaluate many different types of hematologic conditions or malignancies. Because the patient in this case is healthy and young, repeat complete blood count in 3 months would be most appropriate.

Educational Objective: Neutropenia is defined as an absolute neutrophil count of less than 1500 cells/mm³. Benign familial neutropenia affects many individuals worldwide and is most often observed in individuals of African, West Indian, and Middle Eastern descent. Patients with the condition are not at an increased risk for infection despite having a lower neutrophil count. In the absence of other concerning symptoms, further workup is not required. Repeat complete blood count in 3 months would be the most appropriate next step in management.



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- ✓ 18. A 62-year-old man is brought to the emergency department 30 minutes after falling while putting away groceries. The patient reports that he became dizzy before he fell. He has had increasing episodes of dizziness during the past 3 months. He has Parkinson disease. His only medication is carbidopa-levodopa. He appears frail but is not in acute distress. His pulse is 74/min, and blood pressure is 122/70 mm Hg while seated; his pulse is 88/min, and blood pressure is 96/60 mm Hg while standing. When asked to stand, the patient becomes dizzy. Examination shows no other abnormalities. Volume repletion with 0.9% saline is begun. Two hours later, the patient's blood pressure is 128/80 mm Hg while seated; he continues to have dizziness upon standing. Oral fludrocortisone therapy is begun. Repeat laboratory studies 3 days later are most likely to show which of the following findings?
- ☒ A) Decreased serum potassium concentration
 - ☐ B) Decreased serum sodium concentration
 - ☐ C) Decreased urine potassium concentration
 - ☐ D) Increased plasma renin activity
 - ☐ E) Increased serum urea nitrogen concentration
 - ☐ F) Increased urine sodium concentration

Correct Answer: A.

Orthostatic tachycardia and hypotension have many underlying causes, including but not limited to, medication side effects, dehydration, and autonomic instability. Orthostatic symptoms are marked by positional tachycardia (an increase of at least 20/min) and/or hypotension (a decrease of at least 20 mm Hg systolic). This patient shows symptoms of orthostatic hypotension marked by light-headedness and near-syncope on standing as well as a decrease in blood pressure. The vasculature must respond to postural changes to maintain perfusion to the brain and organs of the upper body in response to gravity. Rising from supine to standing results in decreased venous return, decreased carotid sinus baroreceptor activity, and decreased cerebral blood flow. The autonomic nervous system normally responds to these changes with increased mean arterial and diastolic pressure, and increased stroke volume, heart rate, and cardiac output. If a patient cannot mount this response, they may experience symptoms such as light-headedness and dizziness on standing. Treatment involves managing underlying causes, rehydration, and medications that increase blood pressure and the autonomic cardiovascular response to positional changes. Fludrocortisone, a mineralocorticoid and aldosterone agonist, promotes retention of sodium and water, thereby increasing intravascular volume and blood pressure. Fludrocortisone also causes renal losses of potassium and hydrogen ions. As such, decreased



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Orthostatic tachycardia and hypotension have many underlying causes, including but not limited to, medication side effects, dehydration, and autonomic instability. Orthostatic symptoms are marked by positional tachycardia (an increase of at least 20/min) and/or hypotension (a decrease of at least 20 mm Hg systolic). This patient shows symptoms of orthostatic hypotension marked by light-headedness and near-syncope on standing as well as a decrease in blood pressure. The vasculature must respond to postural changes to maintain perfusion to the brain and organs of the upper body in response to gravity. Rising from supine to standing results in decreased venous return, decreased carotid sinus baroreceptor activity, and decreased cerebral blood flow. The autonomic nervous system normally responds to these changes with increased mean arterial and diastolic pressure, and increased stroke volume, heart rate, and cardiac output. If a patient cannot mount this response, they may experience symptoms such as light-headedness and dizziness on standing. Treatment involves managing underlying causes, rehydration, and medications that increase blood pressure and the autonomic cardiovascular response to positional changes. Fludrocortisone, a mineralocorticoid and aldosterone agonist, promotes retention of sodium and water, thereby increasing intravascular volume and blood pressure. Fludrocortisone also causes renal losses of potassium and hydrogen ions. As such, decreased serum potassium concentration is expected in patients who are newly taking fludrocortisone.

Incorrect Answers: B, C, D, E, and F.

Decreased serum sodium concentration (Choice B) and increased urine sodium concentration (Choice F) are incorrect. Fludrocortisone and aldosterone agonists promote renal retention of sodium and water and renal losses of potassium and hydrogen ions. Increased serum sodium and decreased urine sodium would be expected.

Decreased urine potassium concentration (Choice C) is incorrect. Fludrocortisone and aldosterone agonists promote renal retention of sodium and water and renal losses of potassium and hydrogen ions. Increased urine potassium concentration would be expected.

Increased plasma renin activity (Choice D) is incorrect. Aldosterone agonists increase fluid and sodium retention, which increases blood pressure, effective circulating volume (ECV), and renal blood flow (RBF). These effects result in decreased renin activity.

Increased serum urea nitrogen concentration (Choice E) is incorrect. Decreased ECV and RBF activate the renin-angiotensin-aldosterone system, which increases the renal medullary urea nitrogen concentration gradient and serum urea nitrogen. The use of aldosterone would result in fluid retention, sodium retention, and increased blood pressure, ECV, and RBF, with resultant negative feedback on the renin-angiotensin-aldosterone system and decreased serum urea nitrogen.

Educational Objective: Fludrocortisone, a mineralocorticoid and aldosterone agonist, promotes retention of sodium and water, thereby increasing intravascular volume and blood pressure. Fludrocortisone also causes renal losses of potassium and hydrogen ions. It is a common treatment for orthostatic hypotension, which may result from dehydration, medication side effects, autonomic instability, or other causes. Orthostatic symptoms are marked by positional tachycardia (an increase of at least 20/min)



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- ✓ 19. A 27-year-old woman comes to the physician because of a 2-year history of irregular menstrual periods, acne, and increased facial hair growth. Previously, menses occurred at regular 28- to 35-day intervals and lasted 4 days. Menses now occur at 45- to 90-day intervals and last up to 10 days. She is otherwise asymptomatic. She is 162 cm (5 ft 4 in) tall and weighs 55 kg (122 lb); BMI is 21 kg/m². Physical examination shows acne vulgaris and mild hirsutism over the upper lip, chin, breasts, and upper back. Pelvic examination shows no abnormalities. Measurement of which of the following is the most appropriate next step in diagnosis?
- ☐ A) Serum ACTH concentration
 - ☐ B) Serum catecholamine concentrations
 - ☐ C) Serum estrogen concentration
 - ☒ D) Serum 17 α -hydroxyprogesterone concentration
 - ☐ E) Urine electrolyte concentrations

Correct Answer: D.

Congenital adrenal hyperplasia (CAH) is a defect in adrenal steroid biosynthesis, particularly of cortisol, with variable effects on mineralocorticoids and androgens. The most common form of CAH is 21-hydroxylase deficiency. Lack of this enzyme prevents the conversion of progesterone and 17 α -hydroxyprogesterone (which can be measured to establish a diagnosis) to precursors that ultimately produce aldosterone and cortisol in the adrenal gland. In the setting of deficiency, precursors are shunted away from the production of mineralocorticoids and glucocorticoids and toward the production of androgens. Consequently, biologically female patients often undergo virilization due to androgen excess and may also show signs and symptoms of salt wasting, alkalosis, hyperkalemia, and hypovolemia due to aldosterone deficiency. In the classic form of 21-hydroxylase deficiency, biologically female patients present with hypoaldosteronism as well as virilization during infancy, and genetically male patients present with precocious puberty in childhood. However, as seen in this patient, more mild forms can present later in life with irregular menses and hirsutism. Treatment consists of exogenous glucocorticoid and mineralocorticoid supplementation.

Incorrect Answers: A, B, C, and E.

Serum ACTH concentration (Choice A) testing would not be the most appropriate next step. While it is likely that this patient has increased concentrations of ACTH as the result of loss of negative feedback, this would not offer any insight into the cause of her symptoms. It is more appropriate to measure 17 α -hydroxyprogesterone.

Congenital adrenal hyperplasia (CAH) is a defect in adrenal steroid biosynthesis, particularly of cortisol, with variable effects on mineralocorticoids and androgens. The most common form of CAH is 21-hydroxylase deficiency. Lack of this enzyme prevents the conversion of progesterone and 17 α -hydroxyprogesterone (which can be measured to establish a diagnosis) to precursors that ultimately produce aldosterone and cortisol in the adrenal gland. In the setting of deficiency, precursors are shunted away from the production of mineralocorticoids and glucocorticoids and toward the production of androgens. Consequently, biologically female patients often undergo virilization due to androgen excess and may also show signs and symptoms of salt wasting, alkalosis, hyperkalemia, and hypovolemia due to aldosterone deficiency. In the classic form of 21-hydroxylase deficiency, biologically female patients present with hypoaldosteronism as well as virilization during infancy, and genetically male patients present with precocious puberty in childhood. However, as seen in this patient, more mild forms can present later in life with irregular menses and hirsutism. Treatment consists of exogenous glucocorticoid and mineralocorticoid supplementation.

Incorrect Answers: A, B, C, and E.

Serum ACTH concentration (Choice A) testing would not be the most appropriate next step. While it is likely that this patient has increased concentrations of ACTH as the result of loss of negative feedback, this would not offer any insight into the cause of her symptoms. It is more appropriate to measure 17 α -hydroxyprogesterone concentration.

Serum catecholamine concentrations (Choice B) measurement is not appropriate for this patient. Serum catecholamine concentrations can be measured when there is concern for pheochromocytoma. Patients with such a condition present with episodes of increased blood pressure, headache, and palpitations, most commonly due to a tumor of the adrenal medulla.

Serum estrogen concentration (Choice C) testing is not the most appropriate next step. While it is likely that this patient has derangements in estrogen concentration, this would not offer significant insight into the cause of her presentation.

Urine electrolyte concentrations (Choice E) would not be helpful in the diagnosis of this patient. Urine electrolyte concentrations are most often used to offer information regarding pathologies in patients with kidney disease. The origin of this patient's pathology is adrenal, rather than renal.

Educational Objective: Congenital adrenal hyperplasia results from a defect in adrenal steroid biosynthesis. Its most common form, 21-hydroxylase deficiency, presents with salt-wasting in infants or precocious puberty in children. It can also present later in life with less severe features such as irregular menses and hirsutism. It also causes the virilization of XX fetuses, increased concentrations of 17 α -hydroxyprogesterone, hypotension, and hyperkalemia. Concentration of 17 α -hydroxyprogesterone can be measured to establish a diagnosis. Treatment includes the exogenous administration of mineralocorticoids and glucocorticoids.



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20. A 32-year-old woman comes to the emergency department because of a 30-minute history of chest tightness, shortness of breath, and tremulousness that began after she heard of a coworker's unexpected death. She has no history of serious illness and takes no medications. She does not drink alcohol or use illicit drugs. Her pulse is 110/min, respirations are 24/min, and blood pressure is 132/78 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 99%. Examination shows no abnormalities. An ECG shows sinus tachycardia. The physician orders intravenous administration of lorazepam, but the nurse administers intravenous diazepam. Twenty minutes later, the patient's symptoms have not improved. The physician notes that diazepam rather than lorazepam was administered. This incident should be reported to the hospital's quality assurance committee as which of the following?
- ☐ A) Error by the physician
 - ☐ B) Malpractice
 - ☒ C) Medication error
 - ☐ D) Sentinel event
 - ☐ E) This incident does not need to be reported

Correct Answer: C.

A medication error is defined as the administration of an inappropriate or incorrect medication. Though some medication errors may not reach the patient or lead to patient harm, they are still considered reportable patient safety events as similar errors may cause harm to future patients. Hospital safety reporting systems are typically confidential and nonpunitive systems for tracking and analyzing quality and patient safety issues to devise improvements. Medication errors can occur during medication ordering and dispensing. National organizations, such as the Food and Drug Administration, work to decrease medication errors like the error in this case by recommending the design of container labels employ unique colors for different medications and various medication strengths, as well as include clear instructions for patients and prescribers.

Incorrect Answers: A, B, D, and E.

Error by the physician (Choice A) and malpractice (Choice B) are inaccurate. This physician ordered the correct medication. As well, most safety events are attributable to environmental or systems-level factors (eg, similar-appearing medication containers across different medications) rather than individual error.



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- ☐ A) Error by the physician
- ☐ B) Malpractice
- ☒ C) Medication error
- ☐ D) Sentinel event
- ☐ E) This incident does not need to be reported

Correct Answer: C.

A medication error is defined as the administration of an inappropriate or incorrect medication. Though some medication errors may not reach the patient or lead to patient harm, they are still considered reportable patient safety events as similar errors may cause harm to future patients. Hospital safety reporting systems are typically confidential and nonpunitive systems for tracking and analyzing quality and patient safety issues to devise improvements. Medication errors can occur during medication ordering and dispensing. National organizations, such as the Food and Drug Administration, work to decrease medication errors like the error in this case by recommending the design of container labels employ unique colors for different medications and various medication strengths, as well as include clear instructions for patients and prescribers.

Incorrect Answers: A, B, D, and E.

Error by the physician (Choice A) and malpractice (Choice B) are inaccurate. This physician ordered the correct medication. As well, most safety events are attributable to environmental or systems-level factors (eg, similar-appearing medication containers across different medications) rather than individual error.

Sentinel event (Choice D) is an unexpected event (including a medication error) that results in serious physical or psychological harm. This medication error did not cause serious harm and is therefore not a sentinel event.

This incident does not need to be reported (Choice E) is inaccurate. All errors that have the potential to cause harm should be reported.

Educational Objective: A medication error is defined as the administration of an inappropriate or incorrect medication. Though some medication errors may not reach the patient or lead to patient harm, they are still considered reportable patient safety events as similar errors may cause harm to future patients.

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✓ 21. A 27-year-old woman comes to the emergency department because of a 1-week history of diarrhea. She has bipolar disorder treated with medication, but she cannot remember the name of the drug. Two weeks ago, she was feeling depressed and increased the dose she normally takes. She does not drink alcohol or use illicit drugs. Her temperature is 37°C (98.6°F), pulse is 72/min, respirations are 16/min, and blood pressure is 125/75 mm Hg. Physical examination shows a fine resting tremor of the hands. On mental status examination, she is oriented to person but not to place, date, or time. She makes several errors performing serial sevens and is unable to repeat seven digits forward and five in reverse sequence. Which of the following medications is the most likely cause of this patient's symptoms?

- ☐ A) Carbamazepine
- ☐ B) Lamotrigine
- ☒ C) Lithium carbonate
- ☐ D) Topiramate
- ☐ E) Valproic acid

Correct Answer: C.

Lithium carbonate is a mood-stabilizing medication commonly used to treat acute mania and as maintenance treatment to prevent the recurrence of manic or depressive episodes in bipolar disorder. At therapeutic doses, lithium can cause a variety of adverse effects, including tremor, nystagmus, nephrogenic diabetes insipidus, and thyroid dysfunction. Lithium-related tremors typically present with mild, symmetric, action tremors of the upper extremities. Acute lithium toxicity presents with early gastrointestinal symptoms (eg, diarrhea, nausea, vomiting) and delayed neurologic symptoms, including confusion, lethargy, ataxia, and neuromuscular excitability (eg, coarse tremor, myoclonus, hyperreflexia, seizures). This delay occurs because of the time required for lithium to distribute to the central nervous system. Many patients taking lithium daily experience at least one episode of toxicity secondary to lithium's narrow therapeutic index (though this patient's toxicity is likely secondary to using more lithium than prescribed). A lithium concentration should be obtained to help stratify the severity of toxicity. Patients with severe lithium toxicity require hemodialysis.

Incorrect Answers: A, B, D, and E.

Carbamazepine (Choice A) is a mood-stabilizing medication used as a third-line agent in bipolar disorder. Toxicity typically presents with confusion, ataxia, and, if severe,



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Correct Answer: C.

Lithium carbonate is a mood-stabilizing medication commonly used to treat acute mania and as maintenance treatment to prevent the recurrence of manic or depressive episodes in bipolar disorder. At therapeutic doses, lithium can cause a variety of adverse effects, including tremor, nystagmus, nephrogenic diabetes insipidus, and thyroid dysfunction. Lithium-related tremors typically present with mild, symmetric, action tremors of the upper extremities. Acute lithium toxicity presents with early gastrointestinal symptoms (eg, diarrhea, nausea, vomiting) and delayed neurologic symptoms, including confusion, lethargy, ataxia, and neuromuscular excitability (eg, coarse tremor, myoclonus, hyperreflexia, seizures). This delay occurs because of the time required for lithium to distribute to the central nervous system. Many patients taking lithium daily experience at least one episode of toxicity secondary to lithium's narrow therapeutic index (though this patient's toxicity is likely secondary to using more lithium than prescribed). A lithium concentration should be obtained to help stratify the severity of toxicity. Patients with severe lithium toxicity require hemodialysis.

Incorrect Answers: A, B, D, and E.

Carbamazepine (Choice A) is a mood-stabilizing medication used as a third-line agent in bipolar disorder. Toxicity typically presents with confusion, ataxia, and, if severe, seizures. Gastrointestinal symptoms and tremor are uncommon.

Lamotrigine (Choice B) is a mood-stabilizing medication commonly used in bipolar disorder. Toxicity typically presents with central nervous system depression, seizures, and dysrhythmias and occasionally Stevens-Johnson syndrome. Gastrointestinal symptoms and tremor are uncommon.

Topiramate (Choice D) is a mood-stabilizing medication used as a fourth-line agent in bipolar disorder. Toxicity typically presents with central nervous system depression, seizures, coma, muscular rigidity, hypotension, and metabolic acidosis. Gastrointestinal symptoms and tremor are uncommon.

Valproic acid (Choice E) is a mood-stabilizing medication commonly used in bipolar disorder. Toxicity manifests with hyperammonemia leading to encephalopathy, hepatotoxicity with increased AST and ALT, and cerebral edema with coma, and, in some patients, gastrointestinal symptoms and tremor can occur. However, the pattern of early gastrointestinal symptoms and delayed neurologic symptoms is more typical of lithium toxicity, and lithium misuse is more likely to cause symptoms of toxicity than valproic acid misuse given lithium's narrow therapeutic index.

Educational Objective: Acute lithium toxicity presents with early gastrointestinal symptoms and delayed neurologic symptoms, including confusion, lethargy, ataxia, and neuromuscular excitability. Many patients taking lithium carbonate daily experience at least one episode of toxicity secondary to lithium's narrow therapeutic index.

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- ✓ 22. A 19-year-old man comes to the physician because of an 8-hour history of headache, stiff neck, and fever. His brother and sister died of a "brain infection." The patient's temperature is 39.4°C (103°F). He appears lethargic. Examination shows nuchal rigidity. Cerebrospinal fluid analysis shows a leukocyte count of 5000/mm³, a glucose concentration of 10 mg/dL, and a protein concentration of 140 mg/dL. Treatment with ceftriaxone is started, and his symptoms improve. Gram stain shows gram-negative cocci. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) Measurement of serum IgA concentration
 - ☐ B) Measurement of leukocyte myeloperoxidase activity
 - ☒ C) Serum complement assays
 - ☐ D) Neutrophil adhesion studies
 - ☐ E) Neutrophil chemotaxis studies

Correct Answer: C.

Terminal complement component deficiency (C5 to C9) is a common finding in patients who have recurrent infections with *Neisseria* species. Complement activation can occur through the classical, lectin, or alternative pathways, with each pathway converging at the point where C3 is cleaved by C3 convertase, releasing C3a and C3b. Following this, C3b is incorporated into the C3 convertase complex, which subsequently acts on C5 convertase to lower the K_m (increase the affinity) of C5 convertase for its substrate, C5. Cleavage of C5 results in the formation of C5a, a potent chemoattractant, and C5b. C5b complexes with C6, C7, C8, and C9 (terminal complement factors) to form the membrane attack complex (MAC), which allows for the creation of a transmembrane pore that interferes with the integrity of the cellular membrane, leading to cell lysis. Deficiencies of terminal complement factors impair the formation of the MAC and preferentially predispose patients to infection with *Neisseria* species, although infections tend to occur with uncommon serotypes. In this case, the patient has not experienced recurrent infections, but he may have a family history of serum complement deficiency as his brother and sister died of a "brain infection." As such, the most appropriate next step in diagnosis is serum complement assays.

Incorrect Answers: A, B, D, and E.

Measurement of serum IgA concentration (Choice A) may be a reasonable diagnostic step in suspected IgA deficiency. IgA deficiency can be asymptomatic or can present with recurrent sinopulmonary infections and anaphylaxis to blood products.



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Correct Answer: C.

Terminal complement component deficiency (C5 to C9) is a common finding in patients who have recurrent infections with *Neisseria* species. Complement activation can occur through the classical, lectin, or alternative pathways, with each pathway converging at the point where C3 is cleaved by C3 convertase, releasing C3a and C3b. Following this, C3b is incorporated into the C3 convertase complex, which subsequently acts on C5 convertase to lower the K_m (increase the affinity) of C5 convertase for its substrate, C5. Cleavage of C5 results in the formation of C5a, a potent chemoattractant, and C5b. C5b complexes with C6, C7, C8, and C9 (terminal complement factors) to form the membrane attack complex (MAC), which allows for the creation of a transmembrane pore that interferes with the integrity of the cellular membrane, leading to cell lysis. Deficiencies of terminal complement factors impair the formation of the MAC and preferentially predispose patients to infection with *Neisseria* species, although infections tend to occur with uncommon serotypes. In this case, the patient has not experienced recurrent infections, but he may have a family history of serum complement deficiency as his brother and sister died of a “brain infection.” As such, the most appropriate next step in diagnosis is serum complement assays.

Incorrect Answers: A, B, D, and E.

Measurement of serum IgA concentration (Choice A) may be a reasonable diagnostic step in suspected IgA deficiency. IgA deficiency can be asymptomatic or can present with recurrent sinopulmonary infections and anaphylaxis to blood products.

Measurement of leukocyte myeloperoxidase activity (Choice B) may be a reasonable diagnostic step in suspected myeloperoxidase deficiency. This is a common inherited immunodeficiency syndrome characterized by the inability to produce hypochlorous acid within phagolysosomes. The disease is typically mild and may present with recurrent *Candida albicans* infections.

Neutrophil adhesion studies (Choice D) may be a reasonable diagnostic step in suspected leukocyte adhesion deficiency. In leukocyte adhesion deficiency, there is impairment of leukocyte migration to sites of inflammation or infection in the body.

Neutrophil chemotaxis studies (Choice E) may be completed to evaluate for deficiencies in neutrophil migration. These studies may be abnormal in conditions such as leukocyte adhesion deficiency, Chédiak-Higashi syndrome, and hyperimmunoglobulinemia E syndrome.

Educational Objective: Deficiency of the terminal complement proteins prevents the formation of the membrane attack complex (MAC), a critical component in the complement cascade. The MAC allows the formation of a transmembrane pore that interferes with the integrity of the cellular membrane, leading to cell lysis. This deficiency predisposes patients to recurrent infections with atypical serotypes of *Neisseria* species.



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23. A 15-month-old girl is brought to the physician because of a 1-week history of symptoms of an upper respiratory tract infection. Her temperature is 38°C (100.4°F). On examination, she is alert and turns her head appropriately in response to sounds. The left external ear and canal appear normal. The left tympanic membrane is shown. There is minimal movement on pneumatic otoscopy. The right external ear, ear canal, and tympanic membrane appear normal. Which of the following is the most likely diagnosis?

- ☒ A) Acute otitis media
- ☐ B) Cholesteatoma
- ☐ C) Mastoiditis
- ☐ D) Retraction pocket of the tympanic membrane
- ☐ E) Serous otitis media

Correct Answer: A.

Acute otitis media is an acute infection of the middle ear and usually spreads to this space via the eustachian (auditory) tubes from the nasopharynx. Acute otitis media classically occurs in children, often from viral or bacterial pathogens, commonly *Streptococcus pneumoniae* or *Haemophilus influenzae*. It presents with ear pain, often with fever, and with an erythematous tympanic membrane with retrotympanic pus or middle ear effusion. It often occurs concomitantly with or shortly after an upper respiratory infection. Pneumatic otoscopic examination may show decreased mobility of the tympanic membrane. Complications of acute otitis media include mastoiditis and tympanic membrane perforation. Treatment depends on patient age, the underlying cause (viral vs bacterial), and clinical symptoms and signs. In most children under age 4 years, antibiotics are indicated, generally with amoxicillin or amoxicillin-clavulanate as first-line therapies.

Incorrect Answers: B, C, D, and E.

Cholesteatoma (Choice B) describes an overgrowth of keratinized epithelial cells that occurs along the tympanic membrane and can invade the middle ear and mastoid. They are benign but can be locally invasive. On examination, they appear white-to-yellow, and may be localized or invasive. They do not present with fever and erythema unless infection is concomitantly present.

respiratory infection. Pneumatic otoscopic examination may show decreased mobility of the tympanic membrane. Complications of acute otitis media include mastoiditis and tympanic membrane perforation. Treatment depends on patient age, the underlying cause (viral vs bacterial), and clinical symptoms and signs. In most children under age 4 years, antibiotics are indicated, generally with amoxicillin or amoxicillin-clavulanate as first-line therapies.

Incorrect Answers: B, C, D, and E.

Cholesteatoma (Choice B) describes an overgrowth of keratinized epithelial cells that occurs along the tympanic membrane and can invade the middle ear and mastoid. They are benign but can be locally invasive. On examination, they appear white-to-yellow, and may be localized or invasive. They do not present with fever and erythema unless infection is concomitantly present.

Mastoiditis (Choice C) describes bacterial infection of the mastoid air cells. It typically results from untreated or recurrent otitis media, and presents with postauricular pain, swelling, and erythema, along with proptosis of the auricle on examination. This patient lacks clinical features of mastoiditis at this time.

Retraction pocket of the tympanic membrane (Choice D) describes the tympanic membrane being pulled into the middle ear—an invagination of the tympanic membrane. It generally results from chronic and recurrent acute otitis media. This patient's tympanic membrane appears bulging at this time as opposed to retracted. Following resolution of inflammation and infection, a more accurate assessment of retraction pockets can occur.

Serous otitis media (Choice E), otherwise known as otitis media with effusion, involves a collection of noninfected fluid in the middle ear which is typically serous though occasionally mucoid. It often follows an episode of infectious otitis. The tympanic membrane is generally not erythematous, and there is often retrotympanic effusion visible on otoscopy.

Educational Objective: Acute otitis media is an acute infection of the middle ear and classically occurs in children, often from viral or bacterial pathogens. It presents with ear pain, often with fever, and with an erythematous tympanic membrane with retrotympanic pus or a middle ear effusion and decreased movement on pneumatic otoscopy. Treatment generally involves antibiotics.

- ✓ 24. A 42-year-old woman comes to the physician for a follow-up examination 6 weeks after undergoing in vitro fertilization for male factor infertility. She has no history of serious illness. Physical examination shows no abnormalities. Pelvic examination shows vaginal atrophy and a small amount of discharge tinged with blood and mucus in the posterior vaginal vault. Bimanual examination shows no cervical motion tenderness. The uterus is midline, smooth, nontender, and consistent in size with a 10-week gestation. There is fullness and mild tenderness at the left adnexa. Endovaginal ultrasonography shows a twin gestation with one chorion and one amniotic sac; there are two separate embryos, each with a strong heartbeat. This patient's fetuses are at greatest risk for which of the following?
- ☐ A) Akinesia sequence
 - ☐ B) Amniotic band syndrome
 - ☐ C) Choroid plexus cyst
 - ☐ D) Macrosomia
 - ☒ E) Umbilical cord entanglement

Correct Answer: E.

Twin gestations occur due to the splitting of a fertilized ovum (monozygotic twins) or due to the fertilization of two ova by two sperm (dizygotic twins). Monozygotic twins are further classified based on their chorionicity and amnionity, which are believed consequent to how early in development the zygote divides. Early division is believed to lead to dichorionic diamniotic twins, intermediate division to monochorionic diamniotic twins, and later division to monochorionic monoamniotic twins. There is an increased risk for fetal complications in monoamniotic and monochorionic pregnancies. Monoamniotic pregnancies can be complicated by conjoined twins and umbilical cord entanglement, while monochorionic pregnancies can be complicated by twin-twin transfusion syndrome and selective fetal growth restriction. Twin gestations, in general, are more commonly associated with preeclampsia, preterm delivery, fetal growth restriction, and placental abnormalities, such as placenta previa. This patient has monochorionic monoamniotic twins, raising the risk for umbilical cord entanglement, which can result in neurologic sequelae because of chronic intermittent hypoxemia or fetal demise. Elective cesarean delivery for monochorionic monoamniotic pregnancies is commonly recommended between 32 and 34 weeks' gestation.

Incorrect Answers: A, B, C, and D.



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Twin gestations occur due to the splitting of a fertilized ovum (monozygotic twins) or due to the fertilization of two ova by two sperm (dizygotic twins). Monozygotic twins are further classified based on their chorionicity and amnionicity, which are believed consequent to how early in development the zygote divides. Early division is believed to lead to dichorionic diamniotic twins, intermediate division to monochorionic diamniotic twins, and later division to monochorionic monoamniotic twins. There is an increased risk for fetal complications in monoamniotic and monochorionic pregnancies. Monoamniotic pregnancies can be complicated by conjoined twins and umbilical cord entanglement, while monochorionic pregnancies can be complicated by twin-twin transfusion syndrome and selective fetal growth restriction. Twin gestations, in general, are more commonly associated with preeclampsia, preterm delivery, fetal growth restriction, and placental abnormalities, such as placenta previa. This patient has monochorionic monoamniotic twins, raising the risk for umbilical cord entanglement, which can result in neurologic sequelae because of chronic intermittent hypoxemia or fetal demise. Elective cesarean delivery for monochorionic monoamniotic pregnancies is commonly recommended between 32 and 34 weeks' gestation.

Incorrect Answers: A, B, C, and D.

Akinesia sequence (Choice A), also referred to as Pena-Shokeir syndrome type 1, is characterized by intrauterine growth restriction, multiple joint contractures, facial anomalies, and pulmonary hypoplasia, with overall decreased fetal activity. This is a rare syndrome.

Amniotic band syndrome (Choice B) occurs when a band of amniotic tissue compresses a portion of the developing fetus, which can cause limb defects and craniofacial abnormalities. It is often diagnosed prenatally on ultrasonography. Twin gestations do not increase the risk for this syndrome.

Choroid plexus cyst (Choice C) is a benign cyst within the choroid plexus of the brain, often transient. They are associated with trisomy 18 and 21, along with Klinefelter syndrome. Twin gestations do not inherently increase the risk for choroid plexus cysts.

Macrosomia (Choice D) is defined as fetal weight exceeding 4000 g (8-lb 13-oz) and is most commonly associated with maternal hyperglycemia and gestational diabetes. Twin gestations are not a risk factor for macrosomia except in the setting of twin-twin transfusion syndrome, for which one twin is large and the other small for gestational age.

Educational Objective: Twin gestations occur due to the splitting of a fertilized ovum (monozygotic twins) or due to the fertilization of two ova by two sperm (dizygotic twins). Monozygotic twins are further classified based on their chorionicity and amnionicity, which are believed consequent to how early in development the zygote divides. There is an increased risk for fetal complications in monoamniotic and monochorionic pregnancies. Monoamniotic pregnancies can be complicated by conjoined twins and umbilical cord entanglement, while monochorionic pregnancies can be complicated by twin-twin transfusion syndrome and selective fetal growth restriction.



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25. A 12-year-old girl is brought to the physician because of pain in the right thigh; the pain has been present for 2 months but has become markedly worse during the past 10 days. She also has had a low-grade fever for 1 week. Her temperature is 37.2°C (99°F). Examination of the right lower extremity shows tenderness in the middle of the thigh. The remainder of the examination shows no abnormalities. Her leukocyte count is 10,000/mm³. An x-ray of the right femur is shown. Without treatment, which of the following is most consistent with the natural history of this patient's disorder?

- ☐ A) Arterial occlusion
- ☒ B) Lung metastases
- ☐ C) Neurologic deficit in the extremity
- ☐ D) Spontaneous resolution
- ☐ E) Venous occlusion



Correct Answer: B.

Osteosarcoma is the most common primary osseous malignancy in children. It is characterized by cells with enlarged nuclei and a disorganized tissue structure that shows areas of osteoid production (mineralized collagen that provides the structure of bone). This malignancy is locally destructive to bone and can erode through the cortex resulting in a periosteal reaction with elevation of the periosteum along with irregular, ragged borders, and areas of disorganized osteogenesis. It typically occurs in long bones, often involving the tibia or femur. The initial presentation generally includes pain and swelling, though a fragility fracture may be the declaring presentation. Osteosarcoma has a high rate of metastasis to the lungs and high mortality rate, even with adequate surgical resection. Even when initial staging does not detect metastatic disease, individual or small groups of cells may have already metastasized but remain below the threshold of detection. Diagnosis involves imaging and tissue sampling. Treatment typically includes surgical resection combined with chemotherapy.

Incorrect Answers: A, C, D, and E.

Arterial occlusion (Choice A) does not commonly develop in cases of osteosarcoma. Lung metastases are more likely to occur.

Neurologic deficit in the extremity (Choice C) is not the most likely to develop in a case of osteosarcoma. The development of lung metastases is more likely.

Spontaneous resolution (Choice D) is unlikely to occur in osteosarcoma. Osteosarcoma is an aggressive malignancy that typically invades and metastasizes, often even with appropriate treatment.

Venous occlusion (Choice E) may develop in cases of malignancy as patients with cancer often are in a hypercoagulable state. Three factors that increase the risk for venous occlusion include endothelial damage, venous stasis, and the presence of a hypercoagulable state. In this case, metastasis to the lungs is more likely to develop.

Educational Objective: Osteosarcoma is the most common primary osseous malignancy in children. It presents with bony destruction, seen on x-rays as cortical/periosteal irregularity and elevation. Osteosarcoma has a high rate of metastasis to the lungs and high mortality rate, even with adequate surgical resection. Diagnosis involves imaging and biopsy, with treatment often including surgical resection combined with chemotherapy.



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26. A 47-year-old man comes to the physician for a follow-up examination. He has a 1-year history of asthma poorly controlled with salmeterol, tiotropium, theophylline, β -adrenergic agonists, and short courses of prednisone. His temperature is 36.9°C (98.4°F), pulse is 84/min, respirations are 18/min, and blood pressure is 132/76 mm Hg. On pulmonary examination, diffuse expiratory wheezes are heard bilaterally. Previous x-rays of the chest have shown patchy infiltrates with a suggestion of central bronchiectasis. Results of laboratory studies show eosinophilia. Which of the following is the most appropriate next step in diagnosis?

- ☒ A) *Aspergillus* species serologic studies
- ☐ B) Bacterial culture of sputum
- ☐ C) Sputum stain and culture for *Mycobacterium tuberculosis*
- ☐ D) Blood cultures
- ☐ E) Lung biopsy

Correct Answer: A.

The most appropriate next step in diagnosis for this patient is to obtain *Aspergillus* species serologic studies. Patients with asthma or cystic fibrosis are at increased risk for developing allergic bronchopulmonary aspergillosis (ABPA), which is a hypersensitivity reaction caused by the presence of *Aspergillus fumigatus* organisms in the airways. The clinical syndrome is associated with transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis. Patients typically present with constitutional symptoms including generalized fatigue and mild fever, progressive cough, and asthma-like symptoms that are refractory to treatment. Brown or black sputum and hemoptysis may be observed. Laboratory studies are notable for eosinophilia and increased serum IgE concentrations. Chest CT scan will show central bronchiectasis and signs of mucoid impaction. Treatment consists of systemic corticosteroids, antifungal agents, and anti-IgE immunologics depending on the severity and chronicity of the syndrome.

Incorrect Answers: B, C, D, and E.

Bacterial culture of sputum (Choice B) would not be helpful in the diagnosis of ABPA. This would be useful in the identification of a pathogen in a patient with pneumonia, particularly if refractory to initial antibiotic therapies.



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- ☐ B) Blood cultures
- ☐ E) Lung biopsy

Correct Answer: A.

The most appropriate next step in diagnosis for this patient is to obtain *Aspergillus* species serologic studies. Patients with asthma or cystic fibrosis are at increased risk for developing allergic bronchopulmonary aspergillosis (ABPA), which is a hypersensitivity reaction caused by the presence of *Aspergillus fumigatus* organisms in the airways. The clinical syndrome is associated with transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis. Patients typically present with constitutional symptoms including generalized fatigue and mild fever, progressive cough, and asthma-like symptoms that are refractory to treatment. Brown or black sputum and hemoptysis may be observed. Laboratory studies are notable for eosinophilia and increased serum IgE concentrations. Chest CT scan will show central bronchiectasis and signs of mucoid impaction. Treatment consists of systemic corticosteroids, antifungal agents, and anti-IgE immunologics depending on the severity and chronicity of the syndrome.

Incorrect Answers: B, C, D, and E.

Bacterial culture of sputum (Choice B) would not be helpful in the diagnosis of ABPA. This would be useful in the identification of a pathogen in a patient with pneumonia, particularly if refractory to initial antibiotic therapies.

Sputum stain and culture for *Mycobacterium tuberculosis* (Choice C) is not indicated for this patient. Patients with tuberculosis will present with night sweats, weight loss, and fatigue, with chest x-ray demonstrating a cavitory lesion. This patient does not have these symptoms, and chest x-rays show patchy infiltrates, not cavitory lesions.

Blood cultures (Choice D) are not indicated in this patient. This patient does not have systemic signs or symptoms suggestive of bacteremia or fungemia, which commonly would be fever, tachycardia, and/or hypotension. It is more appropriate, given this patient's risk factors and presentation, to pursue more specific workup for *A. fumigatus*.

Lung biopsy (Choice E) is not indicated. Serologic studies would be sufficient in the workup and diagnosis of ABPA. An invasive biopsy would not be appropriate and is not necessary for diagnosis.

Educational Objective: Allergic bronchopulmonary aspergillosis is a hypersensitivity reaction caused by *Aspergillus fumigatus*, and patients with asthma or cystic fibrosis are at increased risk. Patients present with chronic cough that may be productive of dark-colored sputum and hemoptysis. Characteristic findings include transitory pulmonary infiltrates, peripheral eosinophilia, and bronchiectasis. Laboratory studies are notable for eosinophilia and increased serum IgE concentrations.



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- ✓ 27. A 6-year-old boy is brought to the physician for a routine well-child examination prior to a scheduled dental extraction. He has a ventricular septal defect that has not required operative repair. He has no other history of serious illness. Vital signs are within normal limits. Examination shows multiple dental caries. There are no bruits or heaves on auscultation. A grade 1/6 holosystolic murmur is heard best at the lower left sternal border. Which of the following is the most appropriate pharmacotherapy for this patient prior to his dental procedure?
- ☐ A) Amoxicillin
 - ☐ B) Ceftriaxone
 - ☐ C) Doxycycline
 - ☐ D) Sulfisoxazole
 - ☒ E) No pharmacotherapy is indicated

Correct Answer: E.

No antibiotic prophylaxis is indicated in this patient with ventricular septal defect and no prior history of bacterial endocarditis who is about to undergo a dental procedure. Antibiotic prophylaxis with amoxicillin given as a single dose prior to a dental procedure is only indicated for patients at the highest risk for severe complications from bacterial endocarditis. Patients who should receive prophylaxis include those with a prior history of endocarditis, those with any type of prosthetic valve, those with unrepaired congenital cyanotic heart disease, those with repaired congenital cyanotic heart disease with prosthetic material or devices within the first 6 months post-repair, and those with repaired congenital cyanotic heart disease with residual defects at or adjacent to a site of prosthetic repair. While rare, patients with valvular disease in a transplanted heart should also be given prophylaxis. For patients unable to take amoxicillin because of an allergy, alternatives include vancomycin, azithromycin, doxycycline, or a cephalosporin.

Incorrect Answers: A, B, C, and D.

Amoxicillin (Choice A) is the most appropriate choice of medication for prophylaxis in patients at the highest risk for severe complications from bacterial endocarditis



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Correct Answer: E.

No antibiotic prophylaxis is indicated in this patient with ventricular septal defect and no prior history of bacterial endocarditis who is about to undergo a dental procedure. Antibiotic prophylaxis with amoxicillin given as a single dose prior to a dental procedure is only indicated for patients at the highest risk for severe complications from bacterial endocarditis. Patients who should receive prophylaxis include those with a prior history of endocarditis, those with any type of prosthetic valve, those with unrepaired congenital cyanotic heart disease, those with repaired congenital cyanotic heart disease with prosthetic material or devices within the first 6 months post-repair, and those with repaired congenital cyanotic heart disease with residual defects at or adjacent to a site of prosthetic repair. While rare, patients with valvular disease in a transplanted heart should also be given prophylaxis. For patients unable to take amoxicillin because of an allergy, alternatives include vancomycin, azithromycin, doxycycline, or a cephalosporin.

Incorrect Answers: A, B, C, and D.

Amoxicillin (Choice A) is the most appropriate choice of medication for prophylaxis in patients at the highest risk for severe complications from bacterial endocarditis following a dental procedure, except in patients allergic to penicillin. However, this patient does not have a heart defect that requires prophylaxis.

Ceftriaxone (Choice B), a third-generation cephalosporin, is not an appropriate choice for bacterial endocarditis prophylaxis. First- and second-generation cephalosporins are suitable alternatives to amoxicillin when amoxicillin is contraindicated. However, this patient does not have a heart defect that requires prophylaxis.

Doxycycline (Choice C) does provide potential coverage against common pathogens causing bacterial endocarditis, but amoxicillin is typically the preferred choice for prophylaxis. Doxycycline may be an alternative choice for patients who are allergic to penicillin. Doxycycline was previously contraindicated in children under the age of 8 years due to the risk for adverse effects; however, updated 2018 recommendations from the American Academy of Pediatrics indicate that doxycycline is safe for use in children under age 8 for short courses (less than 21 days). Nonetheless, prophylaxis is not indicated for this patient.

Sulfisoxazole (Choice D) is not a commonly recognized medication in the prevention of bacterial endocarditis following dental procedures. Regardless, this patient does not merit prophylaxis since his cardiac condition is not high-risk.

Educational Objective: Antibiotic prophylaxis against bacterial endocarditis prior to a dental procedure is only indicated for patients at the highest risk for severe complications from bacterial endocarditis. Patients who should receive prophylaxis include those with a prior history of endocarditis, with prosthetic valves, with unrepaired, recent prosthetically repaired, or incompletely repaired congenital cyanotic heart disease, and those with transplanted hearts with prosthetic valves. The treatment of choice is typically amoxicillin.



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✓ 28. A 57-year-old man is referred to a surgeon after he is diagnosed with an asymptomatic abdominal aortic aneurysm that is 5 cm in diameter. The average survival of untreated patients with aneurysms larger than 6 cm is 20 months. The mortality of patients with spontaneous **out-of-hospital rupture of an aortic aneurysm is greater** than 85%. Which of the following additional pieces of information will be most useful in assessing this patient's need for an operation?

- ☐ A) Family history of aneurysm
- ☐ B) The patient's ability to pay for health care
- ☒ C) The percentage of aneurysms smaller than 6 cm that rupture
- ☐ D) The probability of renal failure from the procedure
- ☐ E) Whether or not the aneurysm involves the iliac arteries

Correct Answer: C.

The percentage of aneurysms smaller than 6 cm that rupture is the correct answer. Abdominal aortic aneurysms are often diagnosed on screening examinations, which are recommended for men between the ages of 65 and 75 years who have ever smoked cigarettes. Screening tests are often used for early identification of clinical problems, prior to the onset of symptoms. Abdominal aortic aneurysms are associated with a high risk of morbidity and mortality, especially when they reach 6 cm. Despite this, to make an informed decision, the provider and patient will need to know the morbidity and mortality associated with aneurysms that are smaller than 6 cm.

Incorrect Answers: A, B, D, and E.

Family history of aneurysm (Choice A) is incorrect. While a family history of abdominal aortic aneurysm may place a patient at higher risk for developing one, it will not give the provider or patient additional information needed to determine if an operation is required. In this case, the percentage of aneurysms smaller than 6 cm that rupture will help the provider and patient make an informed decision.

The patient's ability to pay for health care (Choice B) is incorrect. Repair of an abdominal aortic aneurysm, which is associated with a high morbidity and mortality, is a medically indicated procedure when necessary. In this scenario considering the risks and benefits of the procedure should be considered, regardless of their ability to afford healthcare.



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Correct Answer: C.

The percentage of aneurysms smaller than 6 cm that rupture is the correct answer. Abdominal aortic aneurysms are often diagnosed on screening examinations, which are recommended for men between the ages of 65 and 75 years who have ever smoked cigarettes. Screening tests are often used for early identification of clinical problems, prior to the onset of symptoms. Abdominal aortic aneurysms are associated with a high risk of morbidity and mortality, especially when they reach 6 cm. Despite this, to make an informed decision, the provider and patient will need to know the morbidity and mortality associated with aneurysms that are smaller than 6 cm.

Incorrect Answers: A, B, D, and E.

Family history of aneurysm (Choice A) is incorrect. While a family history of abdominal aortic aneurysm may place a patient at higher risk for developing one, it will not give the provider or patient additional information needed to determine if an operation is required. In this case, the percentage of aneurysms smaller than 6 cm that rupture will help the provider and patient make an informed decision.

The patient's ability to pay for health care (Choice B) is incorrect. Repair of an abdominal aortic aneurysm, which is associated with a high morbidity and mortality, is a medically indicated procedure when necessary. In this scenario considering the risks and benefits of the procedure should be considered, regardless of their ability to afford healthcare.

The probability of renal failure from the procedure (Choice D) may represent one of the risks related to abdominal aortic aneurysm repair, however, it is not the most useful in this patient scenario. Given the data provided is for abdominal aortic aneurysms that are at least 6 cm, it will be important to assess the risks and benefits of the procedure for patients with a 5 cm abdominal aortic aneurysm.

Whether or not the aneurysm involves the iliac arteries (Choice E) is related to the discussion of the extent of the procedure if necessary, however, it is not the most useful piece of information in assessing this patient's need for surgery. Given the patient has a 5 cm abdominal aortic aneurysm, the most useful information is to know the risk for spontaneous rupture in lesions that are 5 centimeters, as opposed to the data for aneurysms over 6 centimeters.

Educational Objective: Abdominal aortic aneurysms are associated with high morbidity and mortality in patients with spontaneous rupture. Aneurysms are common in men and patients with a significant smoking history, therefore current screening guidelines recommend screening for men between the ages of 65 and 75 years who have ever smoked cigarettes. In the example given, determining the data for aneurysms that are smaller than 6 cm will help the patient and provider come to an informed decision regarding the need for an operation.



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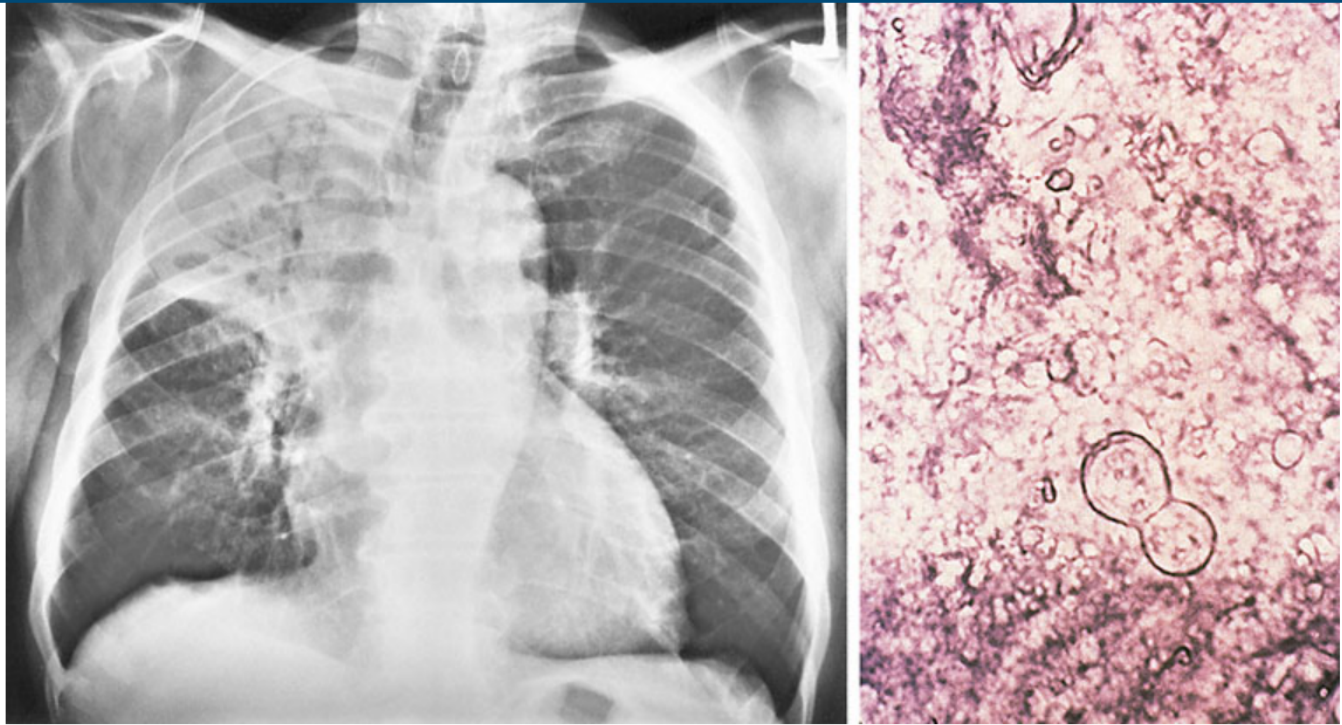
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29. A 27-year-old man with HIV infection comes to the emergency department because of a 10-day history of fever, chills, malaise, and cough productive of yellow sputum. He takes no medications. He appears chronically ill. His temperature is 38.9°C (102°F), pulse is 120/min, respirations are 22/min, and blood pressure is 102/60 mm Hg. Examination shows bitemporal wasting, a dry oropharynx, and white exudate over the oral mucosa. There is diffuse, nontender cervical lymphadenopathy. Coarse breath sounds are heard **over the upper lobe of the right lung**. The remainder of the examination shows no abnormalities. Laboratory

29. A 27-year-old man with HIV infection comes to the emergency department because of a 10-day history of fever, chills, malaise, and cough productive of yellow sputum. He takes no medications. He appears chronically ill. His temperature is 38.9°C (102°F), pulse is 120/min, respirations are 22/min, and blood pressure is 102/60 mm Hg. Examination shows bitemporal wasting, a dry oropharynx, and white exudate over the oral mucosa. There is diffuse, nontender cervical lymphadenopathy. Coarse breath sounds are heard over the upper lobe of the right lung. The remainder of the examination shows no abnormalities. Laboratory studies 2 months ago showed a CD4+ T-lymphocyte count of 24/mm³ (Normal ≥500) and plasma HIV RNA viral load of 350,000 copies/mL. Laboratory studies today show:

Hematocrit	27%
Leukocyte count	3200/mm ³
Platelet count	145,000/mm ³
CD4+ T-lymphocyte count	20/mm ³
HIV RNA viral load	600,000 copies/mL

A chest x-ray and sputum smear are shown. Which of the following is the most likely causal organism?

- ☒ A) *Blastomyces dermatitidis*
- ☐ B) *Candida albicans*
- ☐ C) *Mycoplasma pneumoniae*
- ☐ D) *Pneumocystis jirovecii*
- ☐ E) *Streptococcus pneumoniae*

Correct Answer: A.

Blastomyces dermatitidis is a fungus that is endemic to the Mississippi and Ohio river valleys. On sputum analysis, it has a broad-based budding appearance of similar size as a red blood cell. *B. dermatitidis* is a cause of blastomycosis, which can cause acute and chronic pneumonia in addition to skin lesions with verrucous borders, osteomyelitis, prostatitis, and meningoencephalitis in immunocompromised hosts. As well, more severe pulmonary disease may occur in immunocompromised hosts, which

- ☐ D) *Pneumocystis jirovecii*
- ☐ E) *Streptococcus pneumoniae*

Correct Answer: A.

Blastomyces dermatitidis is a fungus that is endemic to the Mississippi and Ohio river valleys. On sputum analysis, it has a broad-based budding appearance of similar size as a red blood cell. *B. dermatitidis* is a cause of blastomycosis, which can cause acute and chronic pneumonia in addition to skin lesions with verrucous borders, osteomyelitis, prostatitis, and meningoencephalitis in immunocompromised hosts. As well, more severe pulmonary disease may occur in immunocompromised hosts, which is associated with a higher mortality rate. Treatment includes medications such as amphotericin B or azole antifungals. In this case, the patient is immunocompromised with a sputum finding most consistent with *B. dermatitidis*.

Incorrect Answers: B, C, D, and E.

Candida albicans (Choice B) is a fungal pathogen that causes a variety of infections, including vulvovaginitis, urethritis, thrush, and sepsis. *C. albicans* is a dimorphic fungus with pseudohyphae and budding yeast, which is not consistent with the sputum findings in this patient.

Mycoplasma pneumoniae (Choice C) is an atypical organism that can cause pneumonia, which usually presents with fever, cough, and infiltrates on chest x-ray. *M. pneumoniae* is not identified on a Gram stain as it does not have a cell wall. The sputum findings in this case are more consistent with *B. dermatitidis*.

Pneumocystis jirovecii (Choice D) is an opportunistic, yeast-like fungal organism that can cause pneumonia in immunocompromised patients. Chest imaging typically shows diffuse, bilateral infiltrates often prominently in the hila. Disc-shaped organisms may be shown in sputum stained with methenamine silver. The sputum findings in this case are more consistent with *B. dermatitidis*.

Streptococcus pneumoniae (Choice E) is a gram-positive coccus that causes a wide array of infections, including pneumonia, meningitis, otitis media, as well as skin and soft tissue infections. On Gram stain, *S. pneumoniae* appears as gram-positive, lancet-shaped diplococci, which is not shown in this patient's sputum culture.

Educational Objective: *Blastomyces dermatitidis*, a fungus endemic to the Mississippi and Ohio river valleys, is a cause of blastomycosis. In immunocompromised hosts, more severe pulmonary disease may occur, which is associated with a higher mortality rate. *B. dermatitidis* has a broad-based, budding appearance on sputum analysis.



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✓ 30. A 37-year-old man comes to the physician because of a 4-day history of sharp, right-sided chest pain and a 1-week history of cough. He rates his pain as a 7 on a 10-point scale. His cough was initially productive of clear sputum and associated with a runny nose but is now nonproductive. He reports difficulty sleeping and working because of his symptoms. He has no history of serious illness and takes no medications. He does not smoke cigarettes. He recently moved to the Ohio River Valley and has two young children. He works as a biologist studying plant viruses. One week ago, his children had upper respiratory tract infections. The patient appears comfortable but is unable to take deep breaths because of the cough. His temperature is 36.2°C (99.1°F), pulse is 78/min, respirations are 18/min, and blood pressure is 136/78 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 97%. Examination and a chest x-ray show no other abnormalities. Which of the following is the most likely diagnosis?

- ☐ A) Histoplasmosis
- ☒ B) Pleurisy
- ☐ C) Pneumoconiosis
- ☐ D) Pneumothorax
- ☐ E) Sarcoidosis

Correct Answer: B.

Pleurisy, also known as pleuritis, denotes inflammation of the pleura, the thin membrane covering the lungs and lining the chest cavity. Its pathophysiology typically involves an initial insult such as infection, autoimmune disorders, or pulmonary embolism, leading to an inflammatory response characterized by the accumulation of fluid and fibrin within the pleural space. This inflammatory process triggers sharp chest pain exacerbated by breathing, coughing, or movement, a hallmark presentation of pleurisy. Auscultation may disclose pleural friction rubs, while imaging studies such as chest x-ray or ultrasonography aid in diagnosis. Generally, pleurisy will not have radiographic findings, unless it is severe enough to have a pleural effusion accompany it. Treatment strategies for pleurisy aim to address the underlying cause while providing symptomatic relief. Antibiotics are prescribed in cases of bacterial infection, while NSAIDs alleviate pain and decrease inflammation. In severe cases, corticosteroids may be warranted to dampen the immune response. Additionally, thoracentesis may be performed to drain excess fluid, particularly if pleural effusion complicates the presentation. Early recognition and targeted management are paramount in mitigating complications and promoting favorable outcomes in patients with pleurisy.

Incorrect Answers: A, C, D, and E.



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within the pleural space. This inflammatory process triggers sharp chest pain exacerbated by breathing, coughing, or movement, a hallmark presentation of pleurisy. Auscultation may disclose pleural friction rubs, while imaging studies such as chest x-ray or ultrasonography aid in diagnosis. Generally, pleurisy will not have radiographic findings, unless it is severe enough to have a pleural effusion accompany it. Treatment strategies for pleurisy aim to address the underlying cause while providing symptomatic relief. Antibiotics are prescribed in cases of bacterial infection, while NSAIDs alleviate pain and decrease inflammation. In severe cases, corticosteroids may be warranted to dampen the immune response. Additionally, thoracentesis may be performed to drain excess fluid, particularly if pleural effusion complicates the presentation. Early recognition and targeted management are paramount in mitigating complications and promoting favorable outcomes in patients with pleurisy.

Incorrect Answers: A, C, D, and E.

Histoplasmosis (Choice A) is an endemic mycosis caused by *Histoplasma capsulatum* that causes pulmonary illness when spores are inhaled from the environment. Pulmonary histoplasmosis can present in acute, subacute, or chronic phases, generally characterized by fevers, malaise, myalgia with associated cough, and hemoptysis with the development of small, calcified nodules and mediastinal or hilar lymphadenopathy. Histoplasmosis is most associated with exposure to bird or bat droppings.

Pneumoconiosis (Choice C) refers to a group of lung diseases caused by inhaling mineral or silica dust particles over an extended period, commonly encountered in certain occupational settings like mining, construction, or agriculture. These dust particles accumulate in the lungs, leading to inflammation, scarring, and impaired respiratory function, and manifesting as symptoms such as coughing, shortness of breath, and chest tightness. Diagnosis typically involves a thorough occupational history, imaging studies like chest x-rays, and pulmonary function tests to assess lung function and severity of disease.

Pneumothorax (Choice D) presents with pleuritic chest pain and tachypnea with diminished breath sounds and hyperresonance to percussion on the affected side. This diagnosis is unlikely given this patient's unremarkable chest imaging.

Sarcoidosis (Choice E) is an autoimmune disorder that affects multiple body systems. Classically, it presents with cough and dyspnea as well as bilateral hilar lymphadenopathy due to noncaseating granulomatous inflammation. It can also present with anterior uveitis, cutaneous manifestations such as erythema nodosum, and arthralgias.

Educational Objective: Pleurisy, or pleuritis, involves inflammation of the pleura due to various triggers like infection or autoimmune conditions, leading to sharp chest pain exacerbated by movement or breathing. Risk factors include recent infections, autoimmune diseases, pulmonary embolism, and malignancies. Treatment strategies aim to address the underlying cause while providing symptomatic relief. Antibiotics are prescribed in cases of bacterial infection, while NSAIDs alleviate pain and decrease inflammation.



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✓ 31. A 54-year-old woman comes to the physician because of a 2-year history of episodes of nasal congestion and clear discharge, frequent sneezing, itchy eyes, and moderate "sinus pressure." Her symptoms occur throughout the year. She has no history of asthma, hives, generalized swelling, or known allergies. She uses intermittent diphenhydramine with minimal relief. Her other medications are calcium and vitamin D supplementation. She does not have a pet. She has never smoked cigarettes. She lives on the fourth floor of a large apartment complex. She appears in no distress. Her temperature is 36.7°C (98°F), pulse is 68/min, respirations are 12/min, and blood pressure is 113/67 mm Hg. Examination shows pale, edematous nasal mucosa; no other abnormalities are noted. Which of the following is the most appropriate pharmacotherapy?

- ☒ A) Daily nasal beclomethasone
- ☐ B) Daily nasal cromolyn
- ☐ C) Daily nasal phenylephrine
- ☐ D) Daily oral prednisone
- ☐ E) Nasal beclomethasone as needed
- ☐ F) Nasal cromolyn as needed

Correct Answer: A.

Allergic rhinitis is characterized by IgE-mediated inflammation (type I hypersensitivity) of the nasal mucosa. Inciting allergens result in the cross-linking of IgE on the surface of basophils and mast cells, leading to their immediate degranulation and the release of histamine, prostaglandins, and leukotrienes, which results in vasodilation, vascular pooling, and increased vascular permeability. This is followed by the recruitment of a variety of inflammatory cells, predominantly eosinophils, to the nasal mucosa, which can be seen in nasal secretions. Common inciting allergens include plant pollens, animal dander, dust, and mold. Patients commonly experience nasal or sinus congestion, rhinorrhea, sneezing, nasal pruritus, conjunctivitis, and tearing. Patients with allergic rhinitis may also display signs of atopic disease processes, such as asthma or eczema. Treatment includes inhaled nasal corticosteroids, such as beclomethasone, inhaled leukotriene receptor antagonists, and oral antihistamines. Removal or avoidance of the offending allergen is essential to prevent exacerbations and improve symptoms.

Incorrect Answers: B, C, D, E, and F.



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Correct Answer: A.

Allergic rhinitis is characterized by IgE-mediated inflammation (type I hypersensitivity) of the nasal mucosa. Inciting allergens result in the cross-linking of IgE on the surface of basophils and mast cells, leading to their immediate degranulation and the release of histamine, prostaglandins, and leukotrienes, which results in vasodilation, vascular pooling, and increased vascular permeability. This is followed by the recruitment of a variety of inflammatory cells, predominantly eosinophils, to the nasal mucosa, which can be seen in nasal secretions. Common inciting allergens include plant pollens, animal dander, dust, and mold. Patients commonly experience nasal or sinus congestion, rhinorrhea, sneezing, nasal pruritus, conjunctivitis, and tearing. Patients with allergic rhinitis may also display signs of atopic disease processes, such as asthma or eczema. Treatment includes inhaled nasal corticosteroids, such as beclomethasone, inhaled leukotriene receptor antagonists, and oral antihistamines. Removal or avoidance of the offending allergen is essential to prevent exacerbations and improve symptoms.

Incorrect Answers: B, C, D, E, and F.

Daily nasal cromolyn (Choice B) and nasal cromolyn as needed (Choice F) are not appropriate at this time. Cromolyn is a mast cell stabilizer and can be used in the treatment of allergies. However, it is more appropriate to trial daily inhaled corticosteroids, which is the first-line treatment for allergic rhinitis, before moving to options such as cromolyn.

Daily nasal phenylephrine (Choice C) is not an appropriate treatment plan for a patient with allergic rhinitis. Nasal decongestants, such as phenylephrine, are α_1 -adrenergic receptor agonists, working to decrease secretions and inflammation in the nasal mucosa. However, sustained use can lead to rebound nasal congestion symptoms and systemic side effects such as hypertension.

Daily oral prednisone (Choice D) is not recommended in the treatment of allergic rhinitis. While corticosteroids are a first-line treatment for allergic rhinitis, they are used intranasally rather than systemically to avoid unwanted side effects.

Nasal beclomethasone as needed (Choice E) is not the best option for this patient. Nasal beclomethasone is an appropriate treatment option; however, this patient has persistent symptoms on a daily basis. Because of this, the most appropriate treatment is daily, rather than as needed.

Educational Objective: Allergic rhinitis presents with nasal or sinus congestion, rhinorrhea, sneezing, nasal pruritus, conjunctivitis, and tearing, and is often due to seasonal allergens. First-line treatment is with inhaled nasal corticosteroids in patients who have not benefited from oral antihistamines or who cannot tolerate them.



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✓ 32. A 36-year-old woman comes to the physician because of a 2-week history of sharp anal pain that began when she was exercising. During this time, her pain has decreased in severity but has not resolved; it occurs during bowel movements and is associated with small amounts of blood. She has not had itching or feelings of rectal fullness. She has no history of serious illness and takes no medications. She is sexually active with one male partner; she uses condoms consistently. Eight months ago, she vacationed in Mexico. Vital signs are within normal limits. A photograph of the anus is shown. A rectal examination cannot be performed because of pain. The remainder of the examination shows no abnormalities. Which of the following is the most likely diagnosis?

- ☒ A) Anal fissure
- ☐ B) External hemorrhoids
- ☐ C) Fistula in ano
- ☐ D) Herpes simplex proctitis
- ☐ E) Lichen planus
- ☐ F) Lymphogranuloma venereum



Correct Answer: A.

This patient most likely has an anal fissure. Anal fissures are tears in the superficial anal mucosa below the dentate line, typically along the posterior midline. Because of their location below the dentate line with somatic nervous system innervation, they result in significant pain during defecation and are associated with bright red blood on toilet paper. A common initiating factor for the development of an anal fissure is a history of chronic constipation resulting in the passage of hard stool, which can cause

This patient most likely has an anal fissure. Anal fissures are tears in the superficial anal mucosa below the dentate line, typically along the posterior midline. Because of their location below the dentate line with somatic nervous system innervation, they result in significant pain during defecation and are associated with bright red blood on toilet paper. A common initiating factor for the development of an anal fissure is a history of chronic constipation resulting in the passage of hard stool, which can cause trauma to the anal mucosa. While some anal fissures self-resolve, persistent anal fissures can result in anal spasms and increased sphincter tone on examination. Initial management for persistent, symptomatic anal fissures includes administration of stool softeners, sitz baths, topical analgesics, and topical vasodilators. The goal of this combination therapy is to relieve pain, allow for anal sphincter relaxation, and decrease traumatic passage of stool through the anal canal.

Incorrect Answers: B, C, D, E, and F.

External hemorrhoids (Choice B) are characterized by acute, severe anal pain with an associated tender and swollen bulging, blue-purple nodule. Conservative treatment includes topical analgesics and corticosteroids. If refractory to conservative management, ligation with elastic bands or surgical intervention may be required.

Fistula in ano (Choice C) refers to the presence of a tract or cavity lined with granulation tissue that connects the anorectal lumen to the skin adjacent to the anus. They classically arise from chronic inflammation such as in Crohn disease and are differentiated from pilonidal tract disease by the presence of a true connection to the intestinal lumen.

Herpes simplex virus (HSV) is typically transmitted through saliva and respiratory secretions, and can present with a variety of symptoms, including herpes labialis, herpetic whitlow, encephalitis, esophagitis, and keratoconjunctivitis. HSV also has the potential for sexual contact transmission, which can lead to genital herpes. Herpes simplex proctitis (Choice D) usually presents with multiple painful perianal ulcers. It occurs more commonly in immunosuppressed patients.

Lichen planus (Choice E) is an uncommon inflammatory condition of the vulvar skin. Patients may present with vulvar soreness, intense pruritus, and burning. The erosive form may show narrowing of the introitus and loss of the labia minora. This patient's anal pain and bleeding are inconsistent with vulvar lichen planus.

Lymphogranuloma venereum (Choice F) is caused by infection with *Chlamydia trachomatis* subtypes L1, L2, and L3. It presents as small painless genital ulcers with tender inguinal lymphadenopathy. This patient has one painful ulcer that is more consistent with anal fissure.

Educational Objective: Anal fissure is a common cause of severe rectal pain with defecation. A fissure starts with an initial tear in the anoderm with exposure of part of



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✓ 33. A 2-year-old boy is brought to the physician by his mother because of a 1-week history of rectal tissue protruding from his anus when he strains vigorously during bowel movements. The tissue retracts spontaneously within 1 hour. His mother notes that his stools are hard. He has no history of serious illness and receives no medications. Immunizations are up-to-date. Growth and development are appropriate for age. The patient's paternal uncle has a history of intermittent abdominal pain and diarrhea; he recently began a gluten-free diet on the advice of a friend. The patient's family dog recently was treated for worms. Examination of the patient shows no abnormalities; the anus appears normal. Which of the following is the most appropriate next step in management?

- ☐ A) CT scan of the abdomen
- ☒ B) Polyethylene glycol therapy
- ☐ C) Proctosigmoidoscopy
- ☐ D) Sweat chloride test
- ☐ E) Upper gastrointestinal series with small bowel follow-through

Correct Answer: B.

Constipation is a clinical diagnosis involving decreased frequency of stooling or production of hard stools or straining during bowel movements. Constipation and straining can lead to the development of rectal prolapse, which is bulging of rectal tissue out of the anus during straining. Diagnosis of constipation is clinical; however, if obtained, an x-ray of the abdomen can show increased stool burden. For this patient, modification of risk factors should occur, such as increasing fiber in the diet and introducing stool softeners or osmotic agents such as polyethylene glycol.

Incorrect Answers: A, C, D, and E.

Functional constipation is a clinical diagnosis. A CT scan of the abdomen (Choice A) as an imaging modality may show increased stool burden, but it would not aid in the diagnosis of constipation and may expose patients to unnecessary radiation.

Proctosigmoidoscopy (Choice C) is unlikely to help in the diagnosis of functional constipation and would be an invasive test in a child. This patient's rectal tissue protruding during straining that self resolves is rectal prolapse secondary to constipation. Treatment of the functional constipation would likely improve and treat the rectal prolapse.



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- ☐ D) Sweat chloride test
- ☐ E) Upper gastrointestinal series with small bowel follow-through

Correct Answer: B.

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Incorrect Answers: A, C, D, and E.

Functional constipation is a clinical diagnosis. A CT scan of the abdomen (Choice A) as an imaging modality may show increased stool burden, but it would not aid in the diagnosis of constipation and may expose patients to unnecessary radiation.

Proctosigmoidoscopy (Choice C) is unlikely to help in the diagnosis of functional constipation and would be an invasive test in a child. This patient's rectal tissue protruding during straining that self resolves is rectal prolapse secondary to constipation. Treatment of the functional constipation would likely improve and treat the rectal prolapse.

A sweat chloride test (Choice D) is used in the diagnosis of cystic fibrosis. Cystic fibrosis is a clinical syndrome resulting from defects in the CFTR gene, leading to a deficiency in a chloride channel that secretes chloride in the lungs and gastrointestinal tract and reabsorbs chloride in sweat glands. The absence of other findings associated with cystic fibrosis, such as pancreatic insufficiency, diarrhea, malnutrition, and weight loss, argue against cystic fibrosis as the cause of this patient's symptoms.

Upper gastrointestinal series with small bowel follow-through (Choice E) is indicated when structural lesions involving the stomach or small bowel are suspected. This is most commonly indicated for the evaluation of small bowel pathology, such as duodenal atresia, malrotation with volvulus, and Crohn disease.

Educational Objective: Constipation is a clinical diagnosis involving decreased frequency of stooling or production of hard stools or straining during bowel movements. This can lead to the development of rectal prolapse, which is bulging of rectal tissue out of the anus during straining. Increasing fiber in the diet and introducing stool softeners or osmotic agents such as polyethylene glycol can treat constipation.



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- ✓ 34. Two days after undergoing elective right hip replacement, a hospitalized 85-year-old woman is confused and agitated and attempts to pull the intravenous line out of her forearm. She does not recognize her visiting family members and thinks she is in the grocery store. She is told repeatedly that she has just had hip surgery and is in the hospital but remains confused and agitated. She has osteoarthritis. Her medications are acetaminophen and morphine. She drank two glasses of wine weekly for 30 years but stopped drinking alcohol 10 years ago. Prior to hospitalization, she performed all activities of daily living independently. Her temperature is 37°C (98.6°F), pulse is 80/min, respirations are 16/min, and blood pressure is 110/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 99%. Examination shows a clean, dry surgical incision over the right hip. **Cardiopulmonary examination shows no abnormalities.** Neurologic examination shows no focal findings. On mental status examination, she is oriented to person but not to place or time. She follows simple commands. Which of the following is the most appropriate next step in management?
- ☐ A) Diazepam therapy
 - ☐ B) Diphenhydramine therapy
 - ☐ C) Donepezil therapy
 - ☒ D) Haloperidol therapy
 - ☐ E) Lumbar puncture
 - ☐ F) MRI of the brain
 - ☐ G) Placement in four-point restraints

Correct Answer: D.

Delirium is an acute confusional state typically resulting from acute medical illness, sleep disturbances, substance use, and/or medications in older patients who possess a decreased cognitive reserve. Patients with advanced age and/or dementia are particularly vulnerable to delirium. Delirium presents with acute disturbances in awareness, attention, and baseline cognition that fluctuate in severity over the course of the day. Patients may present with perceptual disturbances (eg, hallucinations). In cases with underlying medical causes (eg, infection), treating delirium involves treating the underlying cause. This patient does not show focal signs of infection or neurologic insult on physical examination. Basic laboratory studies and urinalysis should be obtained to exclude covert infection or electrolyte disturbances. If this testing is normal, the patient's delirium is likely secondary to postoperative pain and/or pain medications, decreased mobility, and the unfamiliar hospital environment. The medical team should promote

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Delirium is an acute confusional state typically resulting from acute medical illness, sleep disturbances, substance use, and/or medications in older patients who possess a decreased cognitive reserve. Patients with advanced age and/or dementia are particularly vulnerable to delirium. Delirium presents with acute disturbances in awareness, attention, and baseline cognition that fluctuate in severity over the course of the day. Patients may present with perceptual disturbances (eg, hallucinations). In cases with underlying medical causes (eg, infection), treating delirium involves treating the underlying cause. This patient does not show focal signs of infection or neurologic insult on physical examination. Basic laboratory studies and urinalysis should be obtained to exclude covert infection or electrolyte disturbances. If this testing is normal, the patient's delirium is likely secondary to postoperative pain and/or pain medications, decreased mobility, and the unfamiliar hospital environment. The medical team should promote daytime mobility, nighttime sleep, and frequent reorientation. In severe delirium with associated agitation (eg, combativeness, frequent line-pulling behavior), antipsychotics should be considered to symptomatically treat agitation and prevent patient and/or caregiver harm. Haloperidol is a first-line option because of its minimal anticholinergic activity and decreased likelihood compared to other antipsychotics of worsening cognition.

Incorrect Answers: A, B, C, E, F, and G.

Diazepam therapy (Choice A) is commonly used to treat alcohol withdrawal. However, alcohol withdrawal is unlikely in this patient with normal vitals and no recently reported alcohol use.

Diphenhydramine therapy (Choice B) can be acutely calming. However, its strong central anticholinergic activity can worsen delirium.

Donepezil therapy (Choice C) is used to improve cognition in patients with underlying dementia. This patient is reported to be independent in her activities of daily living outside of the hospital and is therefore unlikely to have dementia. This acute change in her cognition is more likely secondary to delirium.

Lumbar puncture (Choice E) and MRI of the brain (Choice F) may be pursued to exclude neurologic insults as causes of delirium if the patient shows focal neurologic deficits. In this patient with a normal neurologic examination, basic laboratory testing is sufficient.

Placement in four-point restraints (Choice G) is a restrictive option that should be reserved for patients who do not respond to calming medications. Physical restraints may worsen a patient's delirium, especially if primarily characterized by agitation.

Educational Objective: Delirium is an acute confusional state resulting from acute medical illness, sleep disturbances, substance use, and/or medications. Treating the underlying cause is curative, though agitation can be symptomatically treated with antipsychotic medication.



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✓ 35. A 62-year-old woman with stage 4 chronic kidney disease comes to the physician for a routine examination. She feels well and was last seen by a physician 3 months ago. She also has type 2 diabetes mellitus and hypertension. Her medications are short- and long-acting insulin, simvastatin, enalapril, metoprolol, calcium carbonate, sodium citrate, sevelamer, and aspirin. Her temperature is 36.7°C (98°F), pulse is 58/min, respirations are 16/min, and blood pressure is 135/75 mm Hg. Cardiopulmonary and abdominal examinations show no abnormalities. Dorsalis pedis and posterior tibial pulses are palpable bilaterally. Monofilament testing shows decreased sensation over both feet. Proprioception is intact. Laboratory studies show:

Hemoglobin	8.5 g/dL
Hematocrit	27%
Mean corpuscular volume	85 μm ³
Platelet count	165,000/mm ³
Serum	
Na ⁺	135 mEq/L
K ⁺	4.9 mEq/L
HCO ₃ ⁻	22 mEq/L
Ca ²⁺	8.4 mg/dL
Urea nitrogen	40 mg/dL
Creatinine	3.6 mg/dL
Phosphorus	4.6 mg/dL
Estimated glomerular filtration rate	25 mL/min (N>60)

Before beginning erythropoietin therapy, which of the following is the most appropriate next step in management?

- ☐ A) Bone marrow biopsy
- ☐ B) Measurement of serum copper and zinc concentrations
- ☐ C) Measurement of serum haptoglobin concentration and serum lactate dehydrogenase activity
- ☒ D) Measurement of serum iron concentration and total iron-binding capacity

- ☒ D) Measurement of serum iron concentration and total iron-binding capacity
- ☐ E) Measurement of serum vitamin B₁₂ (cobalamin) and folate concentrations
- ☐ F) Serum protein electrophoresis

Correct Answer: D.

The most appropriate next step is to check serum iron concentration and total iron-binding capacity in this patient with anemia and chronic kidney disease. This patient presents with normocytic anemia and has clinical evidence of multiple complications of long-standing diabetes mellitus including neuropathy and chronic kidney disease. An FDA-approved use of erythropoietin (EPO) is in the management of anemia in chronic kidney disease, due to underlying EPO deficiency. EPO is a peptide hormone produced by the kidney that stimulates marrow erythropoiesis. Prior to and during its use, appropriate monitoring includes assessing serum iron, ferritin, transferrin saturation, and total iron-binding capacity. If serum ferritin, iron, or transferrin saturation are low, supplemental iron should be administered prior to initiation of EPO. Initiation of EPO results in prompt erythropoiesis; an absence of appropriate precursors (eg, iron) would limit its effectiveness. All patients initiating EPO should be monitored for serum hemoglobin concentration. Complications include cardiovascular thrombotic events and hypersensitivity reactions.

Incorrect Answers: A, B, C, E, and F.

Bone marrow biopsy (Choice A) would be appropriate if anemia were potentially arising from red cell aplasia, aplastic anemia, or infiltrative disease such as malignancy. This patient's anemia most likely arises from EPO deficiency in the setting of chronic kidney disease.

Measurement of serum copper and zinc concentrations (Choice B) is not necessary prior to initiation of EPO treatment. These assays may be indicated in the evaluation of diseases such as hepatolenticular degeneration (Wilson disease) or zinc deficiency.

Measurement of serum haptoglobin concentration and serum lactate dehydrogenase activity (Choice C) is appropriate in the evaluation of suspected hemolytic anemia. The mechanism of anemia in chronic kidney disease relates to a deficiency of EPO, not due to hemolysis. The causes of hemolysis are many, including autoimmune hemolytic anemia, sickle cell disease and hemoglobinopathies, inborn errors of metabolism, and disseminated intravascular coagulopathy, among others.

Measurement of serum vitamin B₁₂ (cobalamin) and folate concentrations (Choice E) is appropriate in the evaluation of macrocytic anemia, especially in the case of associated dietary deficiency, suspected pernicious anemia, or alcohol use disorder. Patients with such vitamin deficiencies generally present with macrocytic anemia, not



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presents with normocytic anemia and has clinical evidence of multiple complications of long-standing diabetes mellitus including neuropathy and chronic kidney disease. An FDA-approved use of erythropoietin (EPO) is in the management of anemia in chronic kidney disease, due to underlying EPO deficiency. EPO is a peptide hormone produced by the kidney that stimulates marrow erythropoiesis. Prior to and during its use, appropriate monitoring includes assessing serum iron, ferritin, transferrin saturation, and total iron-binding capacity. If serum ferritin, iron, or transferrin saturation are low, supplemental iron should be administered prior to initiation of EPO. Initiation of EPO results in prompt erythropoiesis; an absence of appropriate precursors (eg, iron) would limit its effectiveness. All patients initiating EPO should be monitored for serum hemoglobin concentration. Complications include cardiovascular thrombotic events and hypersensitivity reactions.

Incorrect Answers: A, B, C, E, and F.

Bone marrow biopsy (Choice A) would be appropriate if anemia were potentially arising from red cell aplasia, aplastic anemia, or infiltrative disease such as malignancy. This patient's anemia most likely arises from EPO deficiency in the setting of chronic kidney disease.

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Measurement of serum vitamin B₁₂ (cobalamin) and folate concentrations (Choice E) is appropriate in the evaluation of macrocytic anemia, especially in the case of associated dietary deficiency, suspected pernicious anemia, or alcohol use disorder. Patients with such vitamin deficiencies generally present with macrocytic anemia, not normocytic, as seen in this case.

Serum protein electrophoresis (Choice F) is appropriate in the evaluation of multiple myeloma as a potential cause of anemia. Multiple myeloma also presents with hypercalcemia, bone pain, and frequent infections, making it less likely to be applicable in this case.

Educational Objective: Erythropoietin (EPO) is a peptide hormone produced by the kidney that stimulates marrow erythropoiesis. Prior to and during its use, appropriate monitoring includes assessing serum iron, ferritin, transferrin saturation, and total iron-binding capacity. If serum ferritin, iron, or transferrin saturation are low, supplemental iron should be administered prior to initiation of EPO.



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✓ 36. A 25-year-old woman is admitted to the hospital because of a 1-week history of increasing ptosis, diplopia, slurred speech, and difficulty walking up stairs. She has a 3-year history of myasthenia gravis; her symptoms have been well controlled with prednisone during the past year. She has no other history of serious illness and takes no other medications. Examination shows fluctuating bilateral ptosis, disconjugate gaze, nasal speech, mild bilateral facial weakness, soft voice, and difficulty generating a cough. Muscle strength varies from 3/5 to 4/5 in the shoulders and hips. Which of the following is the most appropriate method of measuring this patient's respiratory status during hospitalization?

- ☐ A) Continuous pulse oximetry
- ☐ B) Daily arterial blood gas analysis
- ☐ C) Daily chest x-ray
- ☐ D) Serial incentive spirometry
- ☒ E) Serial measurements of forced vital capacity

Correct Answer: E.

This patient's presenting findings of progressively worsening, fluctuating ptosis, diplopia, slurred speech, and gait difficulty are suggestive of myasthenia gravis. Myasthenia gravis is a B lymphocyte-driven autoimmune disorder characterized by the formation of inhibitory anti-acetylcholine receptor autoantibodies. Patients typically experience muscular weakness and fatigue that worsens with activation and toward the end of the day. Many patients present with ocular findings, such as drooping eyelids and diplopia, and later develop generalized symptoms involving the proximal muscles. In severe exacerbations (myasthenic crises), patients may develop weakness of the muscles of the throat, diaphragm, and chest wall, leading to dysphagia and acute respiratory failure. Serial forced vital capacity measurements and serial single breath counts (the number a patient can count to in a single exhalation) can help predict impending respiratory failure and need for mechanical ventilation. Forced vital capacity is a pulmonary function test measurement that constitutes the total volume exhaled forcefully after a full inspiration.

Incorrect Answers: A, B, C, and D.

Continuous pulse oximetry (Choice A) and daily arterial blood gas analysis (Choice B) are less sensitive predictors of respiratory failure than serial measurements of forced



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Correct Answer: E.

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Incorrect Answers: A, B, C, and D.

Continuous pulse oximetry (Choice A) and daily arterial blood gas analysis (Choice B) are less sensitive predictors of respiratory failure than serial measurements of forced vital capacity. Pulse oximetry and arterial blood gas analysis commonly show abnormalities only after the patient is already in respiratory failure, when it is too late to intervene.

Daily chest x-ray (Choice C) may help identify a thymoma, which frequently produces myasthenia gravis as a paraneoplastic phenomenon. Chest x-rays assess structural abnormalities rather than respiratory function and are therefore less helpful than forced vital capacity in assessing impending respiratory failure.

Serial incentive spirometry (Choice D) is useful to prevent pulmonary complications in postoperative patients and improve ventilation in patients with atelectasis. It is a therapeutic intervention where the patient inhales deeply into a tube. It is not a measurement tool.

Educational Objective: Myasthenia gravis is an autoimmune neuromuscular disorder characterized by ocular and proximal muscle weakness that worsens with activation. If severe, it can cause respiratory failure. Serial forced vital capacity measurements and serial single breath counts can help predict impending respiratory failure.



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37. Four weeks after undergoing cardiac catheterization because of chest pain, a 60-year-old man comes to the physician because of a 3-day history of a rash over his legs. Six hours before catheterization, administration of 0.9% saline was begun and continued 24 hours postoperatively. He has a 25-year history of type 2 diabetes mellitus complicated by diabetic nephropathy and hepatitis C. His medications are insulin, lisinopril, simvastatin, metoprolol, and aspirin. A photograph of the rash is shown. Examination shows no other abnormalities. His serum creatinine concentration was 1.6 mg/dL before the procedure, 1.5 mg/dL 48 hours after the procedure, and 3.5 mg/dL at today's visit. Urinalysis today shows numerous WBC/hpf and no casts. Which of the following is the most likely diagnosis?
- ☐ A) Acute tubular necrosis
 - ☒ B) Atheroembolic renal disease
 - ☐ C) Contrast-induced nephropathy
 - ☐ D) Cryoglobulinemia vasculitis

Atheroembolic renal disease is the most likely diagnosis in this patient with increased creatinine concentration, pyuria, and livedo reticularis, characteristic findings of cholesterol embolization syndrome. Cholesterol embolization syndrome occurs secondary to the embolization of atherosclerotic plaque contents (eg, cholesterol crystals) from a proximal large artery (eg, aorta) to distal small arteries and arterioles. This results in occlusion of the distal arterial vasculature with cholesterol emboli, which induces a localized inflammatory response and end-organ damage. Dermatologic manifestations of this phenomenon are localized petechiae, livedo reticularis, and blue toe syndrome. Laboratory findings include increased creatinine and leukocytosis with eosinophilia. Risk factors for cholesterol embolization syndrome include trauma, interventional procedures that increase the risk for damage and dislodgement of atherosclerotic plaques such as cardiac catheterization in this case, and aortic dissection. Cholesterol emboli can also involve other organs, potentially resulting in colonic ischemia, cerebrovascular accidents, and skeletal muscle ischemia. Onset is usually acute, and treatment is supportive.

Incorrect Answers: A, C, D, and E.

Acute tubular necrosis (Choice A) presents with increased creatinine often following an ischemic or nephrotoxic insult. Laboratory findings also include casts showing tubular epithelial sloughing, which this patient does not have. Additionally, acute tubular necrosis generally results in increased creatinine concentration within 48 hours of the insult, which this patient did not show.

Contrast-induced nephropathy (Choice C) is a potential adverse effect of contrast administration. Patients most at risk include those with diabetes mellitus and chronic kidney disease secondary to diabetes mellitus. The most important component of prophylaxis against contrast nephropathy is the administration of normal saline prior to, during, and after the administration of contrast. Patients with contrast-induced nephropathy would not present with livedo reticularis. Additionally, contrast-induced nephropathy generally results in increased creatinine concentration within 48 hours of the administration of contrast dye, which this patient did not show.

Cryoglobulinemia vasculitis (Choice D) can present with livedo reticularis but is not a common complication of cardiac catheterization. Risk factors for cryoglobulin formation include chronic viral infections such as hepatitis B and C viruses, HIV, malaria, and Epstein-Barr virus, chronic inflammatory conditions, such as systemic lupus erythematosus and Sjögren syndrome, and lymphoproliferative diseases, such as multiple myeloma.

Progressive diabetic nephropathy (Choice E) presents with gradual increases in the creatinine concentration due to ongoing nonenzymatic glycosylation of the glomerular basement membrane and proteinuria. Livedo reticularis would not be an expected manifestation of progressive diabetic nephropathy, making cholesterol emboli syndrome more likely.

Educational Objective: Interventional procedures increase the risk for atherosclerotic plaque disruption, especially during manipulation of the aorta, which can lead to

- ✓ 38. A 33-year-old woman, gravida 2, para 2, comes to the office for a health maintenance examination. Her pregnancies ended in spontaneous vaginal deliveries of healthy newborns at term. Her second pregnancy 3 years ago was complicated by gestational diabetes, which was controlled with diet. She has no other history of serious illness and takes no medications. She is sexually active and monogamous with her husband. She has no history of abnormal Pap smears; her last Pap smear was 2 years ago. Her mother was diagnosed with breast cancer at the age of 58 years. Her father had a hyperplastic polyp removed from his colon at the age of 51 years. There is no family history of heart disease or diabetes mellitus. Physical examination of the patient, including pelvic examination, shows no abnormalities. Which of the following is the most appropriate next step in management?
- ☐ A) Colonoscopy
 - ☒ B) Determination of hemoglobin A_{1c}
 - ☐ C) Mammography
 - ☐ D) Measurement of serum thyroid-stimulating hormone concentration
 - ☐ E) Pap smear

Correct Answer: B.

Type 2 diabetes mellitus can be asymptomatic or present with polydipsia and polyuria and/or acanthosis nigricans, as well as diabetic ketoacidosis or hyperosmolar hyperglycemic state, if severe. While there are several accepted diagnostic criteria, commonly employed criteria include a hemoglobin A_{1c} \geq 6.5% or a fasting glucose concentration greater than or equal to 126 mg/dL. Current guidelines recommend screening adults aged 35 and over every 3 years for type 2 diabetes, particularly if they are overweight or obese. Patients with a history of gestational diabetes are at an increased risk for developing type 2 diabetes, and thus screening should begin sooner in those patients. Initial management for diabetes mellitus includes weight loss and lifestyle modifications, with the addition of oral antihyperglycemics if these modifications are unsuccessful. A multifactorial approach is necessary to decrease the risk for developing coronary artery disease by controlling hyperglycemia and other risk factors, such as obesity, hyperlipidemia, and hypertension.

Incorrect Answers: A, C, D, and E.

Colonoscopy (Choice A) is not the most appropriate next step for this patient. The United States Preventive Services Task Force (USPSTF) recommends screening for



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Type 2 diabetes mellitus can be asymptomatic or present with polydipsia and polyuria and/or acanthosis nigricans, as well as diabetic ketoacidosis or hyperosmolar hyperglycemic state, if severe. While there are several accepted diagnostic criteria, commonly employed criteria include a hemoglobin A_{1c} \geq 6.5% or a fasting glucose concentration greater than or equal to 126 mg/dL. Current guidelines recommend screening adults aged 35 and over every 3 years for type 2 diabetes, particularly if they are overweight or obese. Patients with a history of gestational diabetes are at an increased risk for developing type 2 diabetes, and thus screening should begin sooner in those patients. Initial management for diabetes mellitus includes weight loss and lifestyle modifications, with the addition of oral antihyperglycemics if these modifications are unsuccessful. A multifactorial approach is necessary to decrease the risk for developing coronary artery disease by controlling hyperglycemia and other risk factors, such as obesity, hyperlipidemia, and hypertension.

Incorrect Answers: A, C, D, and E.

Colonoscopy (Choice A) is not the most appropriate next step for this patient. The United States Preventive Services Task Force (USPSTF) recommends screening for colorectal cancer starting at age 45 years for patients who are at average risk. If there is a family history of colon cancer, screening should begin 10 years earlier than the age of onset in the family member.

Mammography (Choice C) is not the most appropriate next step for this patient. The USPSTF recommends biennial screening mammography for women aged 40 to 74 years, although there are multiple alternative, competing recommendations from other institutions. If there is a family history of breast cancer, especially high-risk subtypes, screening can begin sooner, but it is an individual decision.

Measurement of serum thyroid-stimulating hormone (TSH) concentration (Choice D) is not necessary for this patient. In the absence of any symptoms of thyroid dysfunction, there is no need to screen for abnormal TSH concentrations.

Pap smear (Choice E) is not needed for this patient. The USPSTF recommends screening for cervical cancer every 3 years with cervical cytology alone in women aged 21 to 29 years. For women aged 30 to 65 years, the USPSTF recommends screening every 3 years with cervical cytology alone, every 5 years with high-risk human papillomavirus (hrHPV) testing alone, or every 5 years with hrHPV testing in combination with cytology. This patient's last cervical cancer screening was 2 years ago.

Educational Objective: Women with a history of gestational diabetes, even if managed with diet alone, are at increased risk for the development of type 2 diabetes mellitus. These women should be screened routinely to monitor for development. Commonly employed criteria for diagnosis include a hemoglobin A_{1c} concentration \geq 6.5% or a fasting glucose concentration greater than or equal to 126 mg/dL.



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39. A randomized study is conducted to assess the efficacy of two treatment regimens for acne vulgaris in 360 female high school students. The students are randomly assigned to receive an oral antibiotic and topical cream daily (Regimen A) or an oral contraceptive and topical cream daily (Regimen B). Adherence to each regimen is measured by monthly pill counts. After 3 months of therapy, results show adherence to Regimen A is 56% and adherence to Regimen B is 72% ($P=0.04$). The outcomes are shown:

	Regimen A (%)	Regimen B (%)	P-Value
Subjective improvement	40	65	0.02
Erythema	72	82	0.32
Pruritus	14	18	0.45
Nausea	33	18	0.04
Headache	6	12	0.12

Which of the following best represents the number needed to treat with Regimen B for 3 months to create one additional patient benefit of subjective improvement?

- ☐ A) 2
☐ B) 3
☒ C) 4
☐ D) 6
☐ E) 8

Correct Answer: C.

Four represents the number of patients needed to be treated with Regimen B for 3 months compared to Regimen A to show a subjective improvement in one patient's acne. The number needed to treat (NNT) is an epidemiological measure used to characterize the effectiveness of an intervention. The NNT is the number of patients who must receive a treatment in order to show improvement or prevent the occurrence of one clinical outcome. In this example, 65% of patients in the Regimen B group and



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Four represents the number of patients needed to be treated with Regimen B for 3 months compared to Regimen A to show a subjective improvement in one patient's acne. The number needed to treat (NNT) is an epidemiological measure used to characterize the effectiveness of an intervention. The NNT is the number of patients who must receive a treatment in order to show improvement or prevent the occurrence of one clinical outcome. In this example, 65% of patients in the Regimen B group and 40% of patients in the Regimen A group show improvement over 3 months, which can be used to calculate the absolute risk reduction (ARR) using the formula $ARR = (\text{Regimen B subjective improvement/total patients}) - (\text{Regimen A subjective improvement/total patients})$. This calculation is $ARR = 117/180 - 72/180 = 45/180$ or 25% for the above study. These numbers can then be used to calculate the NNT using the formula, $NNT = 1/ARR$ or $1/25\% = 4$ patients to create one additional patient of subjective improvement. In other words, if four acne patients are treated with Regimen B, one patient would stand to benefit from the treatment when compared to Regimen A.

Incorrect Answers: A, B, D, and E.

2 (Choice A) is incorrect. The NNT of 2 would require a 50% ARR using Regimen B compared to Regimen A using the formula $NNT = 1/ARR$, $2 = 1/50\%$. For example, this would be correct if 162 patients had subjective improvement in Regimen B compared to 72 patients in Regimen A; the ARR would be $= (162/180) - (72/180) = 90/180$ or 50%.

3 (Choice B) is incorrect. The NNT of 3 would require a 33.3% ARR using Regimen B compared to Regimen A using the formula $NNT = 1/ARR$, $3 = 1/33.3\%$. For example, this would be correct if 132 patients had subjective improvement in Regimen B compared to 72 patients in Regimen A; the ARR would be $= (132/180) - (72/180) = 60/180$ or 33.3%.

6 (Choice D) is incorrect. The NNT of 6 would require a 16.67% ARR using Regimen B compared to Regimen A using the formula $NNT = 1/ARR$, $6 = 1/16.67\%$. For example, this would be correct if 102 patients had subjective improvement in Regimen B compared to 72 patients in Regimen A; the ARR would be $= (102/180) - (72/180) = 30/180$ or 16.67%.

8 (Choice E) is incorrect. The NNT of 8 would require a 12.5% ARR using Regimen B compared to Regimen A using the formula $NNT = 1/ARR$, $8 = 1/12.5\%$. For example, this would be correct if ~95 patients had subjective improvement in Regimen B compared to 72 patients in Regimen A; the ARR would be $= (95/180) - (72/180) = 23/180$ or ~12.5%.

Educational Objective: The number needed to treat (NNT) is an epidemiological measure used to characterize the effectiveness of an intervention. The NNT is the number of patients who must receive an intervention to see improvement or prevent the occurrence of one clinical outcome. The NNT can be calculated using the difference in absolute risk reduction between interventions. In a study with a 25% difference in effectiveness between regimens, the NNT is 4 patients using the formula, $NNT = 1/25\%$.



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40. A 55-year-old man comes to the office because of a 6-month history of progressive shortness of breath and fatigue with activities of daily living. He now has shortness of breath when walking to the mailbox and when walking up stairs in his home. He smoked one and one-half packs of cigarettes daily for 40 years but quit 1 year ago. He has no history of serious illness and takes no medications. He is 185 cm (6 ft 1 in) tall and weighs 110 kg (242 lb); BMI is 32 kg/m². His pulse is 100/min, respirations are 18/min, and blood pressure is 150/90 mm Hg. On cardiac examination, S₂ is loud and there is an S₄. A grade 2/6 holosystolic murmur is heard best at the lower left sternal border. The liver span is 12 cm. There is 2+ pitting edema of the lower extremities. An AP x-ray shows flattened diaphragms and an enlarged cardiac silhouette. A lateral view shows filling of the retrosternal airspace. Which of the following is the most appropriate next step in diagnosis?

- ☐ A) Cardiac catheterization
- ☐ B) Cardiac MRI
- ☐ C) Cardiac stress scintigraphy
- ☐ D) CT scan of the chest
- ☒ E) Echocardiography

Correct Answer: E.

This patient is presenting with symptoms and signs of right-sided heart failure, likely secondary to chronic obstructive pulmonary disease (COPD) given his long-term smoking history. This is referred to as cor pulmonale (meaning 'pulmonary heart' in Latin). Chronic lung disease is associated with pulmonary hypertension, and, like systemic hypertension causing left-sided heart failure, over time increased demands of pumping against increased pulmonary arterial resistance causes right-sided heart failure. Examination findings include venous congestion, as seen in this patient with an enlarged liver and peripheral edema. Structural changes to the right ventricle are evident with a palpable heave on physical examination and a loud S₂ heart sound as the pulmonic valve closes under increased pulmonary pressures. Chest x-ray may show signs of COPD such as diaphragmatic flattening or cardiomegaly, both of which are present in this case. Echocardiography is both sensitive and specific for the diagnosis, permitting measurement of cardiac chamber size, function, and pressures.

Incorrect Answers: A, B, C, and D.



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This patient is presenting with symptoms and signs of right-sided heart failure, likely secondary to chronic obstructive pulmonary disease (COPD) given his long-term smoking history. This is referred to as cor pulmonale (meaning 'pulmonary heart' in Latin). Chronic lung disease is associated with pulmonary hypertension, and, like systemic hypertension causing left-sided heart failure, over time increased demands of pumping against increased pulmonary arterial resistance causes right-sided heart failure. Examination findings include venous congestion, as seen in this patient with an enlarged liver and peripheral edema. Structural changes to the right ventricle are evident with a palpable heave on physical examination and a loud S₂ heart sound as the pulmonic valve closes under increased pulmonary pressures. Chest x-ray may show signs of COPD such as diaphragmatic flattening or cardiomegaly, both of which are present in this case. Echocardiography is both sensitive and specific for the diagnosis, permitting measurement of cardiac chamber size, function, and pressures.

Incorrect Answers: A, B, C, and D.

Cardiac catheterization (Choice A) may be appropriate in the diagnosis of this patient, however, it is an invasive test that can follow a less invasive measure, such as echocardiography.

Cardiac MRI (Choice B) can be used to evaluate the structure and function of the heart, however, it is a time-consuming and costly test that can follow echocardiography if indicated. Cardiac MRI is more often used in the diagnosis of infiltrative or inflammatory cardiac conditions such as amyloidosis, sarcoidosis, fibrosis, or myocarditis.

Cardiac stress scintigraphy (Choice C) is an appropriate test in the evaluation of this patient with shortness of breath on exertion, however, this patient's most likely diagnosis is right-sided heart failure. The appropriate initial diagnostic step is echocardiography. Stress testing, to determine if symptomatic coronary artery disease with inducible ischemia is present, can follow echocardiography.

CT scan of the chest (Choice D) is appropriate in the evaluation of multiple cardiac, respiratory, musculoskeletal, gastrointestinal, and vascular conditions, including but not limited to pulmonary embolism, pneumothorax, coronary artery disease, esophageal rupture, traumatic injury, and malignancy. This patient should receive age-appropriate screening with low-dose chest CT scan for malignancy, however this would not assist with the diagnosis of his current presentation, which is more consistent with cor pulmonale.

Educational Objective: Presenting signs and symptoms of right-sided heart failure include shortness of breath on exertion, abnormal heart sounds such as loud S₂, and vascular congestion marked by peripheral edema. It often results from coexisting lung disease, especially chronic obstructive pulmonary disease, due to chronically increased pulmonary vascular resistance. Echocardiography is both sensitive and specific for the diagnosis, permitting measurement of cardiac chamber size, function, and pressures.



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✓ 41. A 27-year-old man is brought to the emergency department 15 minutes after he was rescued from being trapped under debris for several hours following an earthquake. His right lower extremity was severely injured, and his urine is dark. His pulse is 120/min, respirations are 18/min, and blood pressure is 110/75 mm Hg. Physical examination shows a crush injury to the right lower extremity. Serum creatine kinase activity is 120,000 U/L. Additional laboratory studies are most likely to show which of the following findings in this patient?

- ☒ A) Hypocalcemia
- ☐ B) Hypokalemia
- ☐ C) Hypomagnesemia
- ☐ D) Hypophosphatemia
- ☐ E) Hypouricemia

Correct Answer: A.

Rhabdomyolysis develops secondary to muscle necrosis often from trauma, extreme physical exertion, or prolonged immobilization. Presenting symptoms include muscle pain, weakness, and dark urine, which develops due to myoglobin being released from damaged muscle cells. Laboratory findings may include an increase of creatine kinase, myoglobinuria, metabolic acidosis, hyperkalemia, hyperphosphatemia, hyperuricemia, and hypocalcemia. Hypocalcemia develops because of deposition of calcium into the damaged muscle tissue and decreased bone response to parathyroid hormone. Treatment of rhabdomyolysis includes management of electrolyte abnormalities as well as fluid resuscitation to reduce the risk for heme pigment-induced acute kidney injury. Following crush injury, patients with rhabdomyolysis are at high risk for compartment syndrome.

Incorrect Answers: B, C, D, and E.

Hypokalemia (Choice B) is incorrect. A more likely finding in cases of rhabdomyolysis is hyperkalemia. Increased potassium concentrations develop due to potassium release from damaged muscle cells.

Hypomagnesemia (Choice C) is not likely to develop in this case. Magnesium concentrations are relatively unaffected in rhabdomyolysis.

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42. A 28-year-old woman, gravida 2, para 1, at 32 weeks' gestation is brought to the emergency department because of progressive shortness of breath during the past day. She has had intermittent shortness of breath during the past 2 months that she initially attributed to pregnancy. She has not had fever. Her pregnancy has been otherwise uncomplicated. She has no history of serious illness. Her only medication is a prenatal vitamin. She does not smoke cigarettes. On arrival, she is in respiratory distress but is not using accessory muscles of respiration. She has difficulty speaking full sentences. She is 163 cm (5 ft 4 in) tall. She weighed 57 kg (125 lb) prior to her pregnancy; BMI was 22 kg/m². She has had a 9-kg (20-lb) weight gain during her pregnancy. Her temperature is 37.5°C (99.5°F), pulse is 120/min and regular, respirations are 30/min, and blood pressure is 120/85 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90%. Examination shows labored breathing. Diffuse inspiratory and expiratory wheezes are heard. Fundal height is 32 cm. The fetal heart rate is 140/min. In addition to administration of oxygen, which of the following is the most appropriate next step in management?

- ☐ A) Doppler ultrasonography of the lower extremities
- ☒ B) Intravenous administration of heparin
- ☐ C) Intravenous administration of methylprednisolone
- ☐ D) Measurement of serum D-dimer concentration
- ☐ E) Nebulized albuterol therapy

Correct Answer: E.

Asthma is characterized by reversible obstruction to airflow due to spasm of smooth muscle in the bronchi and small airways, presenting with episodic wheezing and shortness of breath with or without a cough. This patient has a history of intermittent shortness of breath, now presenting with an episode of respiratory distress with physical examination findings disclosing diffuse wheezing. These symptoms raise concern for asthma exacerbation. It is imperative to assess the stability of such a patient appropriately and adequately. Given her slightly below normal oxygen saturation and otherwise stable vital signs, the best initial treatment would be the administration of nebulized albuterol therapy. Albuterol is safe to administer to pregnant patients. If further decompensation were to occur, then the addition of intravenous corticosteroids and/or noninvasive positive pressure ventilation should be considered.

Incorrect Answers: A, B, C, and D.



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Correct Answer: E.

Asthma is characterized by reversible obstruction to airflow due to spasm of smooth muscle in the bronchi and small airways, presenting with episodic wheezing and shortness of breath with or without a cough. This patient has a history of intermittent shortness of breath, now presenting with an episode of respiratory distress with physical examination findings disclosing diffuse wheezing. These symptoms raise concern for asthma exacerbation. It is imperative to assess the stability of such a patient appropriately and adequately. Given her slightly below normal oxygen saturation and otherwise stable vital signs, the best initial treatment would be the administration of nebulized albuterol therapy. Albuterol is safe to administer to pregnant patients. If further decompensation were to occur, then the addition of intravenous corticosteroids and/or noninvasive positive pressure ventilation should be considered.

Incorrect Answers: A, B, C, and D.

Doppler ultrasonography of the lower extremities (Choice A) is used for the assessment of either arterial or venous flow abnormalities. In the setting of peripheral arterial disease, Doppler ultrasonography can be used to assess flow-related abnormalities suggestive of stenosis in the lower extremity arteries. For patients presenting with concern for deep venous thrombosis, Doppler ultrasonography can assess for patency of the lower extremity veins. This patient is presenting with asthma exacerbation.

Intravenous administration of heparin (Choice B) would be appropriate if this patient presented with signs and symptoms suggestive of a massive pulmonary embolism and/or if a diagnostic examination showed the presence of a deep venous thrombosis or pulmonary embolism. This patient is presenting with asthma exacerbation, and intravenous anticoagulation would be inappropriate.

Intravenous administration of methylprednisolone (Choice C) is typically used in the acute management of anaphylaxis and in asthma exacerbation. Nebulized albuterol should be attempted first in this patient as it provides immediate relief of bronchoconstriction.

Measurement of serum D-dimer concentration (Choice D) is indicated for patients with a low pretest probability of pulmonary embolism in order to exclude the diagnosis. While this patient presents with respiratory distress, it is secondary to asthma exacerbation, not a pulmonary embolus.

Educational Objective: Asthma is characterized by reversible obstruction to airflow due to spasm of smooth muscle in the bronchi and small airways, presenting with episodic wheezing and shortness of breath with or without a cough. In a stable patient with asthma exacerbation, nebulized albuterol is the first step in management. It is safe to administer to pregnant patients.



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- ✓ 43. A 25-year-old man, who is a welder, comes to the office because of difficulty at work since he was transferred to make emergency repairs on a bridge 1 week ago. He says he always has been very fearful of heights and cannot complete his work each day despite all the safety precautions that are in place. Until this project began, he was able to avoid projects that involved working in high places. He has called in sick for the past 2 days. He fears he will lose his job if he continues to stay home or cause an accident if he returns to work. He has no history of serious illness and takes no medications. Examination shows no abnormalities. Which of the following is the most appropriate next step in management?
- ☐ A) Buspirone therapy
 - ☒ B) Cognitive behavioral therapy
 - ☐ C) Fluoxetine therapy
 - ☐ D) Insight-oriented psychotherapy
 - ☐ E) Lorazepam therapy

Correct Answer: B.

Specific phobia is a psychiatric disorder featuring anxiety about a certain situation or object that leads to avoidance behavior. Common phobias include flying, animals, heights, and enclosed spaces. Management depends on the patient's degree of impairment. If the feared situation arises frequently such that the patient's avoidance causes impairment (as in this case), cognitive behavioral therapy (CBT) that includes graded exposure to the feared situation is most effective (benzodiazepine use may impede the extinction of a patient's learned fear response by teaching the patient they need the benzodiazepine to endure the situation). However, for patients with phobias of situations that occur infrequently (eg, one-time flights) or patients without access to CBT, a small supply of benzodiazepines (eg, lorazepam) can be helpful.

Incorrect Answers: A, C, D, and E.

Buspirone therapy (Choice A) is the use of a serotonin modulator used to treat generalized anxiety disorder. It has no proven efficacy in specific phobia.

Fluoxetine therapy (Choice C) is the use of an antidepressant medication that is a selective serotonin reuptake inhibitor. It is useful in most anxiety disorders. However, CBT and/or benzodiazepines are the preferred treatment of specific phobia.

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- ☐ C) Fluoxetine therapy
- ☐ D) Insight-oriented psychotherapy
- ☐ E) Lorazepam therapy

Correct Answer: B.

Specific phobia is a psychiatric disorder featuring anxiety about a certain situation or object that leads to avoidance behavior. Common phobias include flying, animals, heights, and enclosed spaces. Management depends on the patient's degree of impairment. If the feared situation arises frequently such that the patient's avoidance causes impairment (as in this case), cognitive behavioral therapy (CBT) that includes graded exposure to the feared situation is most effective (benzodiazepine use may impede the extinction of a patient's learned fear response by teaching the patient they need the benzodiazepine to endure the situation). However, for patients with phobias of situations that occur infrequently (eg, one-time flights) or patients without access to CBT, a small supply of benzodiazepines (eg, lorazepam) can be helpful.

Incorrect Answers: A, C, D, and E.

Buspirone therapy (Choice A) is the use of a serotonin modulator used to treat generalized anxiety disorder. It has no proven efficacy in specific phobia.

Fluoxetine therapy (Choice C) is the use of an antidepressant medication that is a selective serotonin reuptake inhibitor. It is useful in most anxiety disorders. However, CBT and/or benzodiazepines are the preferred treatment of specific phobia.

Insight-oriented psychotherapy (Choice D), or psychodynamic psychotherapy, involves exploring the patient's unconscious motivations and conflicts. Psychodynamic psychotherapy has been used for depression and anxiety disorders, though CBT has the strongest research support for specific phobia.

Lorazepam therapy (Choice E) is helpful in treatment of specific phobia when the feared situation occurs infrequently. However, this patient experiences the feared situation every day at work. Additionally, benzodiazepines can cause incoordination that may impair this patient's ability to repair a bridge.

Educational Objective: Specific phobia is a psychiatric disorder featuring anxiety about a certain situation or object that leads to avoidance behavior. Benzodiazepines are appropriate for one-time use in patients with infrequent anxiety related to a specific phobia, but cognitive behavioral therapy is the most effective and safe long-term treatment for specific phobia.

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- ✓ 44. A 22-year-old man who is in the US Army is brought to the military base hospital because of severe groin pain since he was accidentally struck with the stock of a rifle 2 hours ago as he jumped from a personnel carrier. He has no history of major medical illness and takes no medications. Vital signs are within normal limits. Physical examination shows an ecchymotic, edematous scrotum. Urinalysis shows 3+ blood. Doppler ultrasonography of the scrotum shows decreased blood flow to the left testicle. Which of the following is the most appropriate next step in management?
- ☐ A) Application of ice and elevation of the scrotum, in addition to bed rest
 - ☐ B) Cystoscopy
 - ☐ C) Manual examination of the scrotum under anesthesia
 - ☐ D) Orchiectomy
 - ☒ E) Surgical exploration of the left scrotum

Correct Answer: E.

This patient has experienced blunt scrotal trauma and presents with an ecchymotic, edematous scrotum, with decreased testicular blood flow shown on ultrasonography. Blunt scrotal trauma can result in conditions including but not limited to testicular torsion, hematoma, contusion, rupture, and dislocation. In cases of torsion, dislocation, or otherwise compromised vascular supply, emergent scrotal exploration is indicated to identify injuries and repair/restore vascular supply. In general, such exploration should occur within 6 hours of the inciting injury to maximize viability of the testis and preserve function and fertility.

Incorrect Answers: A, B, C, and D.

Application of ice and elevation of the scrotum, in addition to bed rest (Choice A) may be appropriate in cases of scrotal trauma such as hematoma, ecchymosis, or contusion without vascular compromise. In a case with confirmed vascular compromise, emergent surgical exploration is indicated.

Cystoscopy (Choice B) is appropriate in cases of hematuria without associated scrotal trauma. In this patient who has experienced blunt scrotal trauma, there may be



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Correct Answer: E.

This patient has experienced blunt scrotal trauma and presents with an ecchymotic, edematous scrotum, with decreased testicular blood flow shown on ultrasonography. Blunt scrotal trauma can result in conditions including but not limited to testicular torsion, hematoma, contusion, rupture, and dislocation. In cases of torsion, dislocation, or otherwise compromised vascular supply, emergent scrotal exploration is indicated to identify injuries and repair/restore vascular supply. In general, such exploration should occur within 6 hours of the inciting injury to maximize viability of the testis and preserve function and fertility.

Incorrect Answers: A, B, C, and D.

Application of ice and elevation of the scrotum, in addition to bed rest (Choice A) may be appropriate in cases of scrotal trauma such as hematoma, ecchymosis, or contusion without vascular compromise. In a case with confirmed vascular compromise, emergent surgical exploration is indicated.

Cystoscopy (Choice B) is appropriate in cases of hematuria without associated scrotal trauma. In this patient who has experienced blunt scrotal trauma, there may be concomitant urethral or perineal trauma. Noninvasive diagnostic measures such as retrograde urethrography or CT cystography may permit diagnosis without the risk for worsening injury during introduction of a cystoscope.

Manual examination of the scrotum under anesthesia (Choice C) would be neither diagnostic nor therapeutic in a case of ultrasonography-confirmed scrotal vascular compromise. This maneuver would not offer any further diagnostic information and would delay definitive treatment.

Orchiectomy (Choice D) may be necessary in the case of a nonviable testis following trauma or torsion. In this case, surgical exploration would first permit identification and repair of injuries, along with direct assessment of testicular perfusion postrepair. If the testis is determined to be nonviable at that time, orchiectomy could occur.

Educational Objective: Blunt scrotal trauma can result in testicular torsion, hematoma, contusion, rupture, and dislocation. Injuries that result in vascular compromise generally require surgical exploration and repair.



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- ✓ 45. A 66-year-old woman with rheumatoid arthritis comes to the office because of a 1-year history of daily, slowly progressive, severe pain in her knees. She is now unable to walk more than one block. During the past 5 years, her pain has been controlled with etanercept. She has no other history of serious illness and takes no other medications. Vital signs are within normal limits. Examination of the knees shows nodularity and mild swelling but no warmth. There is mild varus deformity, which is corrected to normal valgus with gentle manipulation. There is moderate tenderness to palpation of the medial and lateral joint lines bilaterally. Range of motion of the knees is to 90 degrees of flexion and produces pain. X-rays of both knees show joint destruction, bony erosions, and 5 degrees of varus malalignment; joint spaces are not visible. Which of the following is the most appropriate recommendation to achieve a good long-term prognosis in this patient?
- ☐ A) Adding daily oral celecoxib therapy to the medication regimen
 - ☒ B) Bilateral total knee replacement
 - ☐ C) Intra-articular corticosteroid injections
 - ☐ D) Physical therapy
 - ☐ E) Switching from etanercept to infliximab

Correct Answer: B.

Rheumatoid arthritis is an autoimmune inflammatory arthritis that can also lead to systemic manifestations, such as fevers, weight loss, osteopenia, myopathy, rheumatoid nodules, vasculitis, and pulmonary or cardiac disease (eg, pleurisy, pericarditis). It classically presents with the gradual onset of pain and stiffness of multiple joints, specifically the metacarpophalangeal and proximal interphalangeal joints. The stiffness is often worse in the morning and improves later in the day. Physical examination will show symmetric joint swelling, and long-standing disease can cause progressive joint damage and subsequent deformity. While the peripheral joints are more commonly affected, the axial skeleton can also be involved, particularly the joints of the cervical spine. In cases of severe knee arthritis, total knee replacement is the most likely treatment option to provide a good long-term prognosis. This patient is presenting with severe bilateral knee degenerative changes indicated on x-rays by joint destruction, bony erosions, and the inability to visualize the joint spaces. Bilateral total knee replacement is the most appropriate recommendation to achieve a good long-term prognosis in this patient.

Incorrect Answers: A, C, D, and E.

☐ E) Switching from etanercept to infliximab

Correct Answer: B.

Rheumatoid arthritis is an autoimmune inflammatory arthritis that can also lead to systemic manifestations, such as fevers, weight loss, osteopenia, myopathy, rheumatoid nodules, vasculitis, and pulmonary or cardiac disease (eg, pleurisy, pericarditis). It classically presents with the gradual onset of pain and stiffness of multiple joints, specifically the metacarpophalangeal and proximal interphalangeal joints. The stiffness is often worse in the morning and improves later in the day. Physical examination will show symmetric joint swelling, and long-standing disease can cause progressive joint damage and subsequent deformity. While the peripheral joints are more commonly affected, the axial skeleton can also be involved, particularly the joints of the cervical spine. In cases of severe knee arthritis, total knee replacement is the most likely treatment option to provide a good long-term prognosis. This patient is presenting with severe bilateral knee degenerative changes indicated on x-rays by joint destruction, bony erosions, and the inability to visualize the joint spaces. Bilateral total knee replacement is the most appropriate recommendation to achieve a good long-term prognosis in this patient.

Incorrect Answers: A, C, D, and E.

Adding daily oral celecoxib therapy to the medication regimen (Choice A) may be indicated in patients with less severe knee arthritis or in those that do not wish to pursue surgery. However, long-term use of NSAIDs is not recommended because of their many adverse effects.

Intra-articular corticosteroid injections (Choice C) may be a reasonable treatment option for short-term pain relief. Total knee replacement is more likely to provide this patient with severe arthritis a better long-term prognosis.

Physical therapy (Choice D) is often included in the initial conservative management for arthritis-related knee pain. However, this patient has severe degenerative changes indicated by the absence of joint space on x-rays. Bilateral total knee replacement is more likely to provide a good long-term prognosis.

Switching from etanercept to infliximab (Choice E) is unlikely to significantly improve this patient's bilateral knee pain as she has severe degenerative changes seen on x-rays. Bilateral total knee replacement is the most appropriate recommendation currently.

Educational Objective: Rheumatoid arthritis is an autoimmune erosive arthritis that also presents with systemic symptoms. Long-standing disease can cause progressive joint damage and subsequent deformity. In cases of severe knee arthritis, total knee replacement is the most likely treatment option to provide a good long-term prognosis.



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- ✓ 46. A 13-month-old girl is brought to the office because of a 1-month history of progressive loss of developmental skills. During this time, she has become increasingly uncoordinated and has lost her ability to pull to a standing position. She also has had difficulty grasping and reaching. Her parents note that she no longer plays with toys and crayons, has been less interactive, and has had increasingly poor eye contact. She used to babble, imitate sounds, and say “mama” and “dada,” but she has stopped using words. She has not had head trauma, fever, vomiting, or diarrhea. She has no history of serious illness and receives no medications. She was born at term following an uncomplicated pregnancy and spontaneous vaginal delivery. At her last examination 4 months ago, growth and development were appropriate for age. Today, her length and weight have decreased from the 50th to the 25th percentile, and her head circumference has decreased from the 30th to below the 5th percentile. Examination shows no dysmorphic features. The patient is minimally interactive and makes poor eye contact. She is not in acute distress. She does not reach for toys presented to her. When pulled to a standing position, she has poorly coordinated truncal movements and gait, even with support. MRI of the brain shows microcephaly; no other abnormalities are noted. Which of the following is the most likely diagnosis?
- ☐ A) Autism spectrum disorder
 - ☐ B) Congenital cytomegalovirus infection
 - ☐ C) Hypoxic ischemic encephalopathy
 - ☐ D) Mitochondrial myopathy
 - ☒ E) Rett syndrome
 - ☐ F) Subclinical seizure disorder

Correct Answer: E.

Rett syndrome is characterized by regression of developmental milestones that typically occurs between 6 and 18 months of age and occurs exclusively in females. After an initially normal development, patients subsequently lose speech capabilities and motor skills, and develop stereotypical hand movements and gait abnormalities. Growth abnormalities are also common. Autonomic dysfunction, cardiorespiratory abnormalities, and seizures can occur. Autistic features may be present, but abnormal facial features are not seen. Rett syndrome typically arises from a sporadic mutation of the *MECP2* gene on the paternal X chromosome, explaining the predominance in females. Diagnosis includes clinical and genetic evaluations. A novel disease-modifying agent, trofinetide, has shown modest benefit but is associated with diarrhea. Patients with Rett syndrome commonly require lifelong functional support.



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Correct Answer: E.

Rett syndrome is characterized by regression of developmental milestones that typically occurs between 6 and 18 months of age and occurs exclusively in females. After an initially normal development, patients subsequently lose speech capabilities and motor skills, and develop stereotypical hand movements and gait abnormalities. Growth abnormalities are also common. Autonomic dysfunction, cardiorespiratory abnormalities, and seizures can occur. Autistic features may be present, but abnormal facial features are not seen. Rett syndrome typically arises from a sporadic mutation of the *MECP2* gene on the paternal X chromosome, explaining the predominance in females. Diagnosis includes clinical and genetic evaluations. A novel disease-modifying agent, trofinetide, has shown modest benefit but is associated with diarrhea. Patients with Rett syndrome commonly require lifelong functional support.

Incorrect Answers: A, B, C, D, and F.

Autism spectrum disorder (Choice A) is common imitator of Rett syndrome, as developmental and motor deficits are common. However, this patient's period of regression following typical development is more consistent with Rett syndrome. Additionally, macrocephaly, rather than microcephaly, is common.

Congenital cytomegalovirus infection (Choice B) may be asymptomatic at birth, but clinical signs commonly develop within months rather than more than 1 year. Hearing loss is the most common manifestation. Petechiae, jaundice, hepatosplenomegaly, microcephaly, and small size for gestational age are also common.

Hypoxic ischemic encephalopathy (Choice C) is brain dysfunction caused by hypoxia during delivery. This patient developed normally after birth and is now developmentally regressing, which is more consistent with Rett syndrome.

Mitochondrial myopathy (Choice D) is an inherited metabolic disease that presents with prominent skeletal muscle weakness and may also present with developmental delay and ocular abnormalities. This patient's rapid regression and classic incoordination (rather than weakness) are more consistent with Rett syndrome.

Subclinical seizure disorder (Choice F) may present with progressive cognitive and motor impairment; growth failure is uncommon. Also, epilepsy typically starts after 5 years of age. Rapid developmental and motor decline around 12 months of age is more typical of Rett syndrome.

Educational Objective: Rett syndrome is characterized by regression of developmental milestones that typically occurs between 6 and 18 months of age and occurs exclusively in females. After an initially normal development, patients subsequently lose speech capabilities and motor skills, and develop stereotypical hand movements and gait abnormalities.

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- ✓ 47. An 18-year-old man comes to the urgent care center because of painful swelling below his right jaw that he first noticed on awakening this morning 2 hours ago. He also reports a 2-day history of malaise and mild headache, which he had attributed to jet lag after arriving in the United States from England 3 days ago to participate in a soccer tournament. He says that yesterday evening he did not feel like eating and had mild chills. Medical history is unremarkable and he takes no medications. Temperature is 37.9°C (100.2°F); other vital signs are within normal limits. Physical examination discloses an enlarged and painful right parotid gland; palpation of the left parotid gland discloses no abnormalities. There is no rash or discoloration of the skin, no pharyngeal erythema, and no axillary or inguinal lymphadenopathy. This patient is at increased risk for development of which of the following?
- ☐ A) Focal segmental glomerulosclerosis
 - ☐ B) Hemolytic anemia
 - ☐ C) Non-Hodgkin lymphoma
 - ☒ D) Orchitis
 - ☐ E) Splenomegaly

Correct Answer: D.

Mumps infection is caused by a paramyxovirus and is transmitted through respiratory droplets and direct contact. Clinical manifestations include fever, myalgias, and fatigue, which are then followed by parotid gland swelling. This patient's parotid gland is inflamed, likely secondary to mumps. Mumps orchitis, swelling of the testes, is a potential complication in male patients. There is no specific treatment for mumps, as it is a viral infection, and management involves supportive measures.

Incorrect Answers: A, B, C, and E.

Focal segmental glomerulosclerosis (Choice A) is most commonly associated with sickle cell disease, opioid misuse, and HIV, and is characterized by segmental sclerosis of the glomeruli. It is not associated with mumps.

Hemolytic anemia (Choice B) indicates the active lysis of erythrocytes. Common causes include autoimmune hemolytic anemia, microangiopathic hemolytic anemia, infections such as malaria and babesiosis, inborn errors of erythrocyte synthesis such as sickle cell disease or thalassemia, and a host of other causes. Laboratory values

- ☐ A) Focal segmental glomerulosclerosis
- ☐ B) Hemolytic anemia
- ☐ C) Non-Hodgkin lymphoma
- ☒ D) Orchitis
- ☐ E) Splenomegaly

Correct Answer: D.

Mumps infection is caused by a paramyxovirus and is transmitted through respiratory droplets and direct contact. Clinical manifestations include fever, myalgias, and fatigue, which are then followed by parotid gland swelling. This patient's parotid gland is inflamed, likely secondary to mumps. Mumps orchitis, swelling of the testes, is a potential complication in male patients. There is no specific treatment for mumps, as it is a viral infection, and management involves supportive measures.

Incorrect Answers: A, B, C, and E.

Focal segmental glomerulosclerosis (Choice A) is most commonly associated with sickle cell disease, opioid misuse, and HIV, and is characterized by segmental sclerosis of the glomeruli. It is not associated with mumps.

Hemolytic anemia (Choice B) indicates the active lysis of erythrocytes. Common causes include autoimmune hemolytic anemia, microangiopathic hemolytic anemia, infections such as malaria and babesiosis, inborn errors of erythrocyte synthesis such as sickle cell disease or thalassemia, and a host of other causes. Laboratory values typically show a normocytic anemia, decreased haptoglobin, and increased lactate dehydrogenase and indirect bilirubin. It is not associated with mumps.

Non-Hodgkin lymphoma (Choice C) is associated with Epstein-Barr virus, not mumps or paramyxovirus. Epstein-Barr virus is a cause of infectious mononucleosis, with symptoms including fatigue, malaise, fever, chills, and sore throat. Infectious mononucleosis may also cause splenomegaly (Choice E) or pharyngitis, and laboratory studies may show increased transaminases.

Educational Objective: Mumps infection is caused by a paramyxovirus and is transmitted through respiratory droplets and direct contact. Clinical manifestations include fever, myalgias, and fatigue, which are then followed by parotid gland swelling. Mumps orchitis, swelling of the testes, is a potential complication in male patients.



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✓ 48. A 50-year-old woman is brought to the emergency department because of a 6-day history of confusion, increased thirst, progressive fatigue, and constipation. She also has a 2-month history of moderate low back pain. She has hypertension treated with lisinopril. She is somnolent but easily arousable. She is oriented to person and place but not to time. Temperature is 37.2°C (99.0°F), pulse is 112/min, respirations are 18/min, and blood pressure is 100/60 mm Hg. On examination, the conjunctivae are pale. There is decreased axillary sweat. Cardiopulmonary examination shows no other abnormalities. Results of laboratory studies are shown:

Hemoglobin	9 g/dL
Leukocyte count	4000/mm ³
Platelet count	150,000/mm ³
Serum	
Na ⁺	136 mEq/L
K ⁺	4 mEq/L
Cl ⁻	100 mEq/L
HCO ₃ ⁻	25 mEq/L
Ca ²⁺	13.8 mg/dL
Urea nitrogen	60 mg/dL
Glucose	90 mg/dL
Creatinine	1.4 mg/dL
Protein, total	8.8 g/dL
Albumin	3 g/dL

Intravenous administration of 0.9% saline is begun. Eight hours later, examination findings and laboratory study results are unchanged. In addition to continuing intravenous administration of fluids and beginning furosemide therapy, which of the following is the most appropriate next step in management?

- ☐ A) Bone marrow transplant
- ☐ B) Cytarabine and daunorubicin therapy



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Correct Answer: D.

The patient's findings of anemia, hypercalcemia, and renal dysfunction are suggestive of a diagnosis of multiple myeloma. Multiple myeloma is a malignancy caused by the neoplastic proliferation of plasma cells. Neoplastic plasma cells overproduce monoclonal immunoglobulin and light or heavy chains, which may result in acute kidney injury. Patients also commonly present with constitutional symptoms of fatigue and weight loss, hepatosplenomegaly, symptoms of hypercalcemia (eg, abdominal cramping, kidney stones, psychiatric disturbance), symptoms of anemia (eg, pallor, light-headedness, dyspnea on exertion), or with opportunistic infections secondary to immune dysfunction. In multiple myeloma, local and systemic secretion of cytokines including IL-1, tumor necrosis factor- α , macrophage inflammatory protein, and receptor activator of nuclear factor- κ B ligand (RANKL) stimulate osteoclastic activity leading to increased bone turnover and release of calcium and phosphate into circulation. There is also a relative reduction in normal bone turnover and osteoblastic activity, which impairs the body's ability to reuse and recycle calcium to create new bone. Osteoclast inhibitors may be used in cases of multiple myeloma to decrease the risk for pathologic fractures, skeletal related events, and decrease skeletal-related pain. Pamidronate is a bisphosphonate medication that functions by binding to the bone matrix to inhibit osteoclast activity, thus inhibiting bone resorption, making it the most appropriate next step in management.

Incorrect Answers: A, B, C, and E.

Bone marrow transplant (Choice A) is not the most appropriate next step in management for this patient. Bone marrow transplants may be used to delay disease progression in certain patients with multiple myeloma. However, prior to bone marrow transplant, induction chemotherapy is often completed. Pamidronate therapy is the most appropriate next step in management for this patient presenting with symptomatic hypercalcemia likely secondary to multiple myeloma.

Cytarabine and daunorubicin therapy (Choice B) is not the most appropriate next step in management. Cytarabine and daunorubicin are not commonly used for treatment of multiple myeloma.

Immune globulin therapy (Choice C) can be used to treat autoimmune conditions (eg, immune thrombocytopenia), neuroimmunologic disorders (eg, Guillain-Barré syndrome), and immunodeficiencies, among other pathologies. Immune globulin therapy is not regularly used in cases of multiple myeloma.

Prednisone therapy (Choice E) may be indicated for many different conditions. This patient is presenting with symptomatic hypercalcemia likely secondary to underlying multiple myeloma. Therapy with pamidronate is the most appropriate next step in management.

Educational Objective: Malignant plasma cell clones in multiple myeloma locally secrete cytokines such as IL-1, tumor necrosis factor- α , and receptor activator of nuclear

- ✓ 49. A 33-year-old woman comes to the clinic to discuss results of a recent Pap smear. She feels well. She has no history of serious illness and takes no medications. She does not smoke cigarette or use illicit drugs. She drinks two cocktails daily. She is sexually active with three male partners; they use condoms inconsistently. The physician informs the patient that the Pap smear results show atypical squamous cells of undetermined significance, and test results are negative for high-risk human papillomavirus infection. The patient says she wants treatment to cure her infection. In addition to expressing empathy toward the patient, which of the following is the most appropriate next step in management?
- ☐ A) Cone biopsy
 - ☒ B) Counseling the patient on safer-sex practices
 - ☐ C) Cryotherapy
 - ☐ D) Loop electrosurgical excision of the cervical transformation zone
 - ☐ E) Repeat Pap smear in 6 months

Correct Answer: B.

Cervical squamous cell carcinoma begins from the transformation zone or squamocolumnar junction, which demarcates the ectocervix and its squamous epithelium from the endocervix and its columnar epithelium. It is the target region of a Pap smear, a screening test for cervical neoplasia. Pap smears are recommended every 3 years in women aged 21 to 29 years and every 5 years in conjunction with human papillomavirus (HPV) co-testing (every 3 years if co-testing is not performed) in women aged 30 to 65 years. Risk factors for cervical cancer include high-risk HPV strains 16, 18, 31, or 33 infections, early age at onset of sexual activity, tobacco use, oral contraceptive use, immunosuppression, and infection with HIV or other sexually transmitted infections. This patient is presenting with atypical squamous cells of undetermined significance, which is the most common abnormal finding in a Pap smear and may be related to infection with HPV or other benign inflammatory conditions. This patient's negative HPV test is reassuring. The most important action is to counsel this patient on safer-sex practices to decrease her risk for other sexually transmitted infections as well as HPV.

Incorrect Answers: A, C, D, and E.

Cone biopsy (Choice A) and loop electrosurgical excision of the cervical transformation zone (Choice D) are recommended when there is evidence of cervical intraepithelial neoplasia (CIN) on a Pap smear. It allows evaluation of a larger region of the cervix for cervical carcinoma and may be curative in the setting of CIN if a margin of normal



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☐ E) Repeat Pap smear in 6 months

Correct Answer: B.

Cervical squamous cell carcinoma begins from the transformation zone or squamocolumnar junction, which demarcates the ectocervix and its squamous epithelium from the endocervix and its columnar epithelium. It is the target region of a Pap smear, a screening test for cervical neoplasia. Pap smears are recommended every 3 years in women aged 21 to 29 years and every 5 years in conjunction with human papillomavirus (HPV) co-testing (every 3 years if co-testing is not performed) in women aged 30 to 65 years. Risk factors for cervical cancer include high-risk HPV strains 16, 18, 31, or 33 infections, early age at onset of sexual activity, tobacco use, oral contraceptive use, immunosuppression, and infection with HIV or other sexually transmitted infections. This patient is presenting with atypical squamous cells of undetermined significance, which is the most common abnormal finding in a Pap smear and may be related to infection with HPV or other benign inflammatory conditions. This patient's negative HPV test is reassuring. The most important action is to counsel this patient on safer-sex practices to decrease her risk for other sexually transmitted infections as well as HPV.

Incorrect Answers: A, C, D, and E.

Cone biopsy (Choice A) and loop electrosurgical excision of the cervical transformation zone (Choice D) are recommended when there is evidence of cervical intraepithelial neoplasia (CIN) on a Pap smear. It allows evaluation of a larger region of the cervix for cervical carcinoma and may be curative in the setting of CIN if a margin of normal cervical tissue is identified on histology. This patient only has atypical cells of undetermined significance with a negative HPV test, making further tissue sampling unnecessary.

Cryotherapy (Choice C) can be used for the treatment of CIN through a specialized device that results in freezing of the abnormal tissue. This has been shown to decrease the risk for progression to invasive cervical carcinoma.

Repeat Pap smear in 6 months (Choice E) is not necessary since this patient is presenting with atypical squamous cells of undetermined significance and a negative HPV test. This patient can resume her normal interval of Pap smear testing with these results.

Educational Objective: Pap smears are recommended every 3 years in women aged 21 to 29 years and every 5 years in conjunction with human papillomavirus (HPV) co-testing (every 3 years if co-testing is not performed) in women aged 30 to 65 years. Risk factors for cervical cancer include high-risk HPV strains 16, 18, 31, or 33 infections, early age at onset of sexual activity, tobacco use, oral contraceptive use, immunosuppression, and infection with HIV or other sexually transmitted infections.



50. A 7-year-old boy is brought to the office by his mother because of a 1-week history of hair loss and a 1-month history of an enlarging, itchy lesion on his scalp. He has no history of serious illness. Vaccinations are up-to-date. Physical examination shows the findings in the photograph. Microscopic examination of a scraping of the lesion treated with KOH shows branching hyphae. Which of the following is the most appropriate initial pharmacotherapy for this patient?

- ☐ A) Oral doxycycline
- ☒ B) Oral terbinafine
- ☐ C) Topical miconazole
- ☐ D) Topical tacrolimus
- ☐ E) Topical triamcinolone



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Correct Answer: B.

Oral terbinafine is an allylamine antifungal that inhibits squalene epoxidase and is used for the treatment of tinea capitis. Tinea capitis is most often caused by *Trichophyton tonsurans* infection in the United States, which invades the inside of the hair follicle causing an endothrix infection. Tinea capitis classically presents with round, pruritic, alopecic patches with associated pustules and scale. Additional examination findings may include posterior occipital, posterior auricular, or cervical lymphadenopathy. Tinea capitis is more commonly present in children compared with adults and is transmissible. Patients may be diagnosed clinically or based on the results of fungal culture. Terbinafine is commonly used to treat *T. tonsurans*, while griseofulvin may be used in refractory cases.

Incorrect Answers: A, C, D, and E.

Oral doxycycline (Choice A) is a tetracycline antibiotic targeting the 30S ribosomal subunit of bacterial species. In dermatology, doxycycline is often used for the treatment of gram-positive skin and soft tissue infections, as well as acne vulgaris. Terbinafine, not doxycycline, is the treatment of choice for tinea capitis.

Topical miconazole (Choice C) is an azole antifungal agent used in the treatment of cutaneous tinea infections, including tinea pedis, tinea corporis, and tinea cruris. While miconazole has antifungal properties, topical antifungal agents have poor efficacy against tinea capitis, as this represents an endothrix infection. While miconazole may be commonly used for the treatment of cutaneous tinea infections, terbinafine is the treatment of choice in cases of tinea capitis.

Topical tacrolimus (Choice D) is a calcineurin inhibitor. In dermatology, it is used to treat inflammatory skin conditions, notably psoriasis and alopecia areata, among others. This patient's presentation is consistent with an infectious cause, not an inflammatory or immune-mediated condition.

Topical triamcinolone (Choice E) is used to treat inflammatory conditions of the skin, including psoriasis. Triamcinolone is a topical corticosteroid that is compounded into low potency, medium potency, or high potency formulations that are applied to areas of dermatitis. Skin atrophy, development of striae, and hypopigmentation are adverse effects of topical corticosteroids when they are used long term. This patient's lesion is consistent with tinea capitis, as opposed to an inflammatory condition like psoriasis.

Educational Objective: Tinea capitis is most often caused *Trichophyton tonsurans* in the United States. Tinea capitis classically presents with round, pruritic patches with overlying pustules and scale, in addition to posterior occipital, posterior auricular, or cervical lymphadenopathy. Tinea capitis is usually treated with oral antifungal agents

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- ✓ 1. A comatose 77-year-old woman with alcohol-induced cirrhosis is being treated for bacterial peritonitis and hepatic encephalopathy. After 1 week of antibiotic and lactulose therapy, she remains in a coma. She has a living will stating that she does not want resuscitation or artificial feeding if she has a terminal condition. Her son is her health care proxy. When the patient's course is reviewed with the husband, he states that he is tired of seeing his wife suffer and asks the physician to just make her comfortable and discontinue all therapy. Which of the following is the most appropriate response?
- ☐ A) Comply with the husband's wishes
 - ☐ B) Contact the hospital ethics committee
 - ☐ C) Continue the current treatment plan
 - ☐ D) Recommend liver transplantation
 - ☒ E) Review the situation with the husband and the son together

Correct Answer: E.

A code status refers to the interventions a patient wishes to receive currently and in the event of cardiac or respiratory arrest. Full code signifies that the patient wants to be resuscitated (including chest compressions and at least temporary intubation) and receive life-prolonging medical treatment. The “do not resuscitate” (DNR) code status signifies that a patient wants to continue current medical treatment but, in the event of cardiorespiratory failure, would not want cardiopulmonary resuscitation (CPR). Many patients choose this code status because of poor baseline functional status or prognosis, as CPR commonly results in a prolonged recovery and poor quality of life as a result of complications, such as rib fractures, sternum fracture, and mediastinal hematoma. The comfort care code status involves withdrawing current medical, life-prolonging treatment, and, in the event of cardiorespiratory failure, avoiding CPR. Comfort care aligns with the hospice care philosophy of prioritizing quality of life and symptom palliation over life prolongation. After a significant change in a patient's medical situation, the patient or, if the patient is incapacitated (as in this case), the patient's decision-maker (eg, legal guardian, durable power of attorney, or legal next-of-kin) should be given the opportunity to update the patient's code status before further intervention. Though this patient specifies a DNR code status in her living will, her husband is proposing a de-escalation of care consistent with a comfort care code status. However, as her health care proxy (a title that typically takes precedence over legal next-of-kin), her son needs to approve this decision as well. Also, it is best practice to include all close family members in these consequential discussions.



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Incorrect Answers: A, B, C, and D.

Comply with the husband's wishes (Choice A) would be illegal, as her son is this patient’s health care proxy. As well, it is best practice to include all close family members in these consequential discussions.

Contact the hospital ethics committee (Choice B) is not necessary at this time. First, the son should be included in these discussions. The ethics committee may be consulted if family members disagree on a course of action, though ultimately this is the son’s decision to make.

Continue the current treatment plan (Choice C) would be inappropriate. Since this patient’s medical situation has changed during her admission, the patient or the patient’s surrogate decision-maker should be given the opportunity to update her code status.

Recommend liver transplantation (Choice D) is a life-prolonging measure that is inconsistent with this patient’s DNR code status. It is also inconsistent with her husband’s expressed wishes. Further discussion including her health care proxy is needed to clarify her code status.

Educational Objective: If an incapacitated patient experiences a significant medical change, surrogate decision-makers (eg, health care proxy or legal next-of-kin) should be given the opportunity to update the patient’s code status. Close family members should be given the opportunity to discuss possible code status changes. The health care proxy should make the ultimate decision.



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2. A 57-year-old woman comes to the physician because she has had a sore throat for 3 days. She has not had any other symptoms. She has Graves disease treated with propylthiouracil and type 2 diabetes mellitus controlled with metformin and rosiglitazone. She takes daily ibuprofen and glucosamine for knee pain. There is no family history of serious illness. Her temperature is 37.3°C (99.2°F), pulse is 108/min, respirations are 14/min, and blood pressure is 123/74 mm Hg. There are multiple tender, enlarged lymph nodes in the anterior cervical chain. Examination of the oropharynx shows erythema and edema of the tonsils with no exudate. The remainder of the examination shows no abnormalities. A rapid streptococcal test is positive. Laboratory studies show:

Hemoglobin	12 g/dL
Hematocrit	38%
Erythrocyte count	4 million/mm ³
Mean corpuscular hemoglobin	30 pg/cell
Mean corpuscular hemoglobin concentration	34% Hb/cell
Mean corpuscular volume	90 μm ³
Leukocyte count	2300/mm ³
Segmented neutrophils	24%
Eosinophils	5%
Basophils	2%
Lymphocytes	62%
Monocytes	7%
Platelet count	200,000/mm ³

Which of the following medications is the most likely cause of this patient's neutropenia?

- ☐ A) Glucosamine
- ☐ B) Ibuprofen
- ☐ C) Metformin
- ☒ D) Propylthiouracil

- ☐ B) Ibuprofen
- ☐ C) Metformin
- ☒ D) Propylthiouracil
- ☐ E) Rosiglitazone

Correct Answer: D.

Drug-induced neutropenia secondary to propylthiouracil administration is the most likely cause of this patient's decreased neutrophil count on laboratory study findings. Neutropenia is defined as an absolute neutrophil count of less than 1500 cells/mm^3 . The risk for spontaneous infection substantially increases when the neutrophil count drops below 500 cells/mm^3 . Neutropenia is usually secondary to exposure to known myelotoxic agents, such as chemotherapeutic drugs, but can also develop from many different medications, including propylthiouracil, carbamazepine, methimazole, clozapine, and some antiarrhythmic medications. Treatment involves immediate withdrawal of the implicated medication and management of any underlying infection. Additionally, granulocyte colony-stimulating factor can sometimes hasten neutrophil recovery.

Incorrect Answers: A, B, C, and E.

Glucosamine (Choice A) has been found to suppress neutrophil function, which is thought to provide an anti-inflammatory property. However, the medication is not known to cause neutropenia. Propylthiouracil is the most likely cause of this patient's neutropenia.

Ibuprofen (Choice B) is an NSAID often used for musculoskeletal pain. Propylthiouracil is the most likely cause of this patient's neutropenia.

Metformin (Choice C) is known to cause gastrointestinal side effects, such as nausea, diarrhea, and vomiting. Neutropenia is not a known side effect of metformin.

Rosiglitazone (Choice E) is known to exacerbate congestive heart failure and cause anemia. Neutropenia is not a known adverse effect of the medication.

Educational Objective: Neutropenia is defined by an absolute neutrophil count of less than 1500 cells/mm^3 . Neutropenia usually develops secondary to exposure to known myelotoxic agents, such as chemotherapeutic drugs, but can also develop from many medications, including propylthiouracil, carbamazepine, methimazole, and clozapine. Management includes immediate withdrawal of the implicated medication.



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✓ 3. A 25-year-old woman comes to the physician because of a 1-week history of progressive diarrhea. She initially had loose, nonbloody bowel movements six to eight times daily; during the past 2 days, she has passed small amounts of loose, bloody, stool with mucus 8 to 10 times daily associated with lower abdominal cramps. She went on a vacation in Guatemala 3 weeks ago. She has no history of serious illness and takes no medications. Her current temperature is 37.6°C (99.7°F). Abdominal examination shows mild tenderness in the lower quadrants. Rectal examination shows mucus and gross blood in the rectal vault. Examination of a wet mount preparation of the stool shows trophozoites. Which of the following is the most appropriate pharmacotherapy?

- ☐ A) Mesalamine enemas and oral diphenoxylate and atropine
- ☐ B) Oral ciprofloxacin and loperamide
- ☐ C) Oral fluconazole
- ☐ D) Oral mebendazole
- ☒ E) Oral metronidazole and iodoquinol
- ☐ F) Oral trimethoprim-sulfamethoxazole

Correct Answer: E.

Infection with *Entamoeba histolytica* leads to amoebiasis (amoebic dysentery). *E. histolytica* is an amoebic parasite and forms cysts that can be transmitted through the fecal-oral route and through ingestion of contaminated water. Amoebic cysts mature to trophozoites in the large bowel. Trophozoites may invade the colonic mucosa and interstitium, leading to symptoms of abdominal pain and bloody diarrhea. Invasive infections can lead to colonic perforation and sepsis. Diagnosis can be made with identification of cysts on stool microscopy or peripheral blood smear, which may show trophozoites with endosomes containing red blood cells, as well as by antibody assay or polymerase chain reaction test. Colonoscopy shows mucosal ulcers that are often flask-shaped. Treatment requires combination therapy with metronidazole or tinidazole as well as an anti-luminal agent such as paromomycin or iodoquinol.

Incorrect Answers: A, B, C, D, and F.

Mesalamine enemas and oral diphenoxylate and atropine (Choice A) is a treatment for Crohn disease. This would not be appropriate for the treatment of *E. histolytica*.

Correct Answer: E.

Infection with *Entamoeba histolytica* leads to amoebiasis (amoebic dysentery). *E. histolytica* is an amoebic parasite and forms cysts that can be transmitted through the fecal-oral route and through ingestion of contaminated water. Amoebic cysts mature to trophozoites in the large bowel. Trophozoites may invade the colonic mucosa and interstitium, leading to symptoms of abdominal pain and bloody diarrhea. Invasive infections can lead to colonic perforation and sepsis. Diagnosis can be made with identification of cysts on stool microscopy or peripheral blood smear, which may show trophozoites with endosomes containing red blood cells, as well as by antibody assay or polymerase chain reaction test. Colonoscopy shows mucosal ulcers that are often flask-shaped. Treatment requires combination therapy with metronidazole or tinidazole as well as an anti-luminal agent such as paromomycin or iodoquinol.

Incorrect Answers: A, B, C, D, and F.

Mesalamine enemas and oral diphenoxylate and atropine (Choice A) is a treatment for Crohn disease. This would not be appropriate for the treatment of *E. histolytica*.

Oral ciprofloxacin and loperamide (Choice B) is a treatment option for traveler's diarrhea. The most common cause of traveler's diarrhea is enterotoxigenic *Escherichia coli*. Symptoms include acute, diffuse, crampy abdominal pain and bloating, and profuse, frequent episodes of watery, nonbloody diarrhea. Trophozoites would not be seen on stool examination.

Oral fluconazole (Choice C) is used for the treatment of vulvovaginal candidiasis. Vulvovaginal candidiasis results from the overgrowth of *Candida* and presents with vulvar erythema, vaginal pruritus, and thick, white discharge.

Oral mebendazole (Choice D) is an anthelmintic drug that binds to beta-tubulin inhibiting microtubule polymerization, decreases parasite glucose utilization, and decreases in energy production. Blocking microtubule polymerization inhibits cell motility and intracellular transport. It is used for treating *Echinococcus granulosus*, *Taenia solium*, and *Enterobius vermicularis*, among other parasitic worms.

Oral trimethoprim-sulfamethoxazole (Choice F), a folate antagonist combination antibiotic, is useful for the treatment of bronchitis from a bacterial source and urinary tract infections, and for prophylaxis of pneumocystis pneumonia. It does not play a role in the management of *E. histolytica* infection.

Educational Objective: *Entamoeba histolytica* is an amoebic parasite that causes intestinal amoebiasis, which presents with abdominal pain and bloody diarrhea. Treatment requires combination therapy with metronidazole or tinidazole along with an anti-luminal agent such as paromomycin or iodoquinol.



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✓ 4. A 6-month-old boy is admitted to the hospital for treatment of his second episode of *Streptococcus pneumoniae* sepsis within the past 5 weeks. He was treated for acute otitis media at the ages of 3 months and 4 months. He was delivered at term following an uncomplicated pregnancy and delivery. His maternal uncle died as an infant of *Haemophilus influenzae* type b sepsis and meningitis. The patient's immunizations are up-to-date, and there have been no complications of immunizations. He is mildly irritable but easily consoled. His temperature is 38.5°C (101.3°F), pulse is 160/min, and respirations are 42/min. Examination shows no lymphadenopathy. Laboratory studies show:

Leukocyte count	17,000/mm ³
Segmented neutrophils	64%
Bands	8%
Eosinophils	1%
Lymphocytes	25%
Monocytes	2%
Serum	
IgG	20 mg/dL (N=172–1069)
IgA	<5 mg/dL (N=4.4–84)
IgM	<5 mg/dL (N=33–126)

His CD4+ and CD8+ T-lymphocyte counts are within the reference ranges. There are no CD19 B lymphocytes. The remainder of the examination shows no abnormalities. Which of the following is the most appropriate next step in management?

- ☐ A) Subcutaneous granulocyte colony–stimulating factor therapy
- ☐ B) Subcutaneous interferon gamma-1b therapy
- ☒ C) Intravenous immune globulin therapy
- ☐ D) Bone marrow transplantation
- ☐ E) Thymus transplantation

☒ C) Intravenous immune globulin therapy

☐ D) Bone marrow transplantation

☐ E) Thymus transplantation

Correct Answer: C.

X-linked agammaglobulinemia is caused by a mutation in the gene encoding Bruton tyrosine kinase (BTK). BTK is necessary for all stages of B-lymphocyte development and proliferation. As B lymphocytes are responsible for secreting immunoglobulins once they differentiate into plasma cells, a defect in B-lymphocyte maturation leads to a dearth of plasma cells and severely low immunoglobulin concentrations of every class, including IgM, IgG, IgE, and IgA. Patients, like this one, present with recurrent infections due to impaired humoral immunity. Management includes replacement of immunoglobulins with intravenous immune globulin therapy, which would be the most appropriate next step in this case.

Incorrect Answers: A, B, D, and E.

Subcutaneous granulocyte colony-stimulating factor therapy (Choice A) may be used to treat neutropenia. It is commonly used in patients receiving certain chemotherapy regimens. It is not the treatment for agammaglobulinemia.

Subcutaneous interferon gamma-1b therapy (Choice B) is often used as a treatment for chronic granulomatous disease. The patient in this case has low concentrations of all immunoglobulins, which is more consistent with agammaglobulinemia.

Bone marrow transplantation (Choice D) is not used in cases of agammaglobulinemia. Bone marrow transplantation may be a curative treatment for severe combined immunodeficiency syndrome.

Thymus transplantation (Choice E) has been used in cases of DiGeorge syndrome but is not an appropriate step in management for agammaglobulinemia.

Educational Objective: Patients with X-linked agammaglobulinemia often present with a history of recurrent infections. On laboratory studies, they have severely low immunoglobulin concentrations in every class, as B-lymphocyte development and proliferation is affected in the disease. Treatment for X-linked agammaglobulinemia includes intravenous immune globulin therapy.



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✗ 5. A 17-year-old boy undergoes an emergency inguinal herniorrhaphy under general anesthesia for an incarcerated hernia. On induction, he aspirates vomitus while being observed by the anesthesiologist. He is intubated but is difficult to ventilate. Examination shows acrocyanosis. Breath sounds are equal. Pulse oximetry on 100% oxygen shows an oxygen saturation of 85%. Which of the following is the most appropriate next step in management?

- ☐ A) CT angiography of the chest
- ☒ B) Antibiotic therapy
- ☐ C) Bronchoscopy
- ☐ D) Needle thoracostomy
- ☐ E) Tracheostomy

Correct Answer: C.

The inhalation of orogastric contents is known as aspiration, and it can occur from simple fluids, such as water, or stomach contents, such as emesis or regurgitated products. Small volume, simple fluid aspiration may be resorbed by the lung without any consequence of infection, irritation, or compromised gas exchange. In other cases, large volume aspiration may sufficiently impair gas exchange resulting in refractory hypoxia, which is seen in this patient. Given the known aspiration of vomitus accompanied with difficult ventilation, acrocyanosis, and hypoxia despite appropriate supplementation, it is most appropriate to pursue direct visualization and evacuation of the vomitus that is causing the obstruction. Even following removal of vomitus, the patient is still at risk for downstream complications. The aspiration of acidic stomach contents may cause aspiration pneumonitis, while the aspiration of gastrointestinal flora and additional bacteria can cause aspiration pneumonia. Aspiration pneumonia classically presents with a cough productive of foul-smelling sputum, fever, chills, chest pain, shortness of breath, and rhonchi on examination. Imaging classically shows an infiltrate in the most dependent segments of lung at the time of aspiration (eg, in the superior segment of the inferior lobe when supine or lower lobes when erect), and treatment includes broad-spectrum antibiotics with sufficient coverage of oral flora, gram-negative rods, and anaerobes.

Incorrect Answers: A, B, D, and E.

CT angiography of the chest (Choice A) is not appropriate for this patient. While a pulmonary embolism is an appropriate consideration in a patient with refractory hypoxia.



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Correct Answer: C.

The inhalation of orogastric contents is known as aspiration, and it can occur from simple fluids, such as water, or stomach contents, such as emesis or regurgitated products. Small volume, simple fluid aspiration may be resorbed by the lung without any consequence of infection, irritation, or compromised gas exchange. In other cases, large volume aspiration may sufficiently impair gas exchange resulting in refractory hypoxia, which is seen in this patient. Given the known aspiration of vomitus accompanied with difficult ventilation, acrocyanosis, and hypoxia despite appropriate supplementation, it is most appropriate to pursue direct visualization and evacuation of the vomitus that is causing the obstruction. Even following removal of vomitus, the patient is still at risk for downstream complications. The aspiration of acidic stomach contents may cause aspiration pneumonitis, while the aspiration of gastrointestinal flora and additional bacteria can cause aspiration pneumonia. Aspiration pneumonia classically presents with a cough productive of foul-smelling sputum, fever, chills, chest pain, shortness of breath, and rhonchi on examination. Imaging classically shows an infiltrate in the most dependent segments of lung at the time of aspiration (eg, in the superior segment of the inferior lobe when supine or lower lobes when erect), and treatment includes broad-spectrum antibiotics with sufficient coverage of oral flora, gram-negative rods, and anaerobes.

Incorrect Answers: A, B, D, and E.

CT angiography of the chest (Choice A) is not appropriate for this patient. While a pulmonary embolism is an appropriate consideration in a patient with refractory hypoxia, this patient has no history of coagulopathy or deep venous thrombosis, making pulmonary embolism highly unlikely especially given the recent aspiration of vomitus.

Antibiotic therapy (Choice B) is a reasonable consideration in a patient with known aspiration. However, in the setting of persistent hypoxia and acrocyanosis, it is more appropriate and imperative to identify and remove the cause of the hypoxia. This is best achieved with bronchoscopy next, and antibiotics can be considered at a later time.

Needle thoracostomy (Choice D) would not be appropriate for this patient. Needle thoracostomy is used when there is concern for pneumothorax. This patient has equal breath sounds bilaterally and a recent episode of aspiration of vomitus, making pneumothorax unlikely.

Tracheostomy (Choice E) should not be performed. This patient already has a stable airway as he is intubated, and the persistent hypoxia is most likely from a disruption in gas exchange or mechanical obstruction from the aspiration event. A tracheostomy would cause unnecessary harm.

Educational Objective: Patients with known aspiration events and persistent hypoxia or acrocyanosis despite adequate oxygen supplementation should be evaluated further for removal of the aspirate. A bronchoscopy with direct visualization and removal of the aspirate is the most appropriate step in management.



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- ✓ 6. A 17-year-old primigravid patient at 34 weeks' gestation comes to the physician because of a 3-week history of increasing pain and numbness of her right hand. The pain is greatest over the lateral half of her hand. During this time, she also has had episodes of cramping of her right index, middle, and ring fingers that form a "claw." She has no history of serious illness. Examination shows 2+ edema of the hands and fingers. Pressing the extensor surfaces of the flexed wrists together reproduces the pain. Which of the following is the most appropriate initial step in management?

☒ A) Application of a removable wrist splint

- ☐ B) Oral calcium supplements
- ☐ C) Oral corticosteroid therapy
- ☐ D) Corticosteroid injection
- ☐ E) Release of the median nerve

Correct Answer: A.

Mechanical entrapment of the median nerve leading to carpal tunnel syndrome is the most likely mechanism of this patient's symptoms. The carpal tunnel describes a conduit in the wrist that is formed by the flexor retinaculum anteriorly and the carpal bones posteriorly. Both the median nerve and the flexor tendons of the fingers travel through this canal. Increased pressure in this canal can lead to compression of the median nerve resulting in paresthesias of the first three digits, primarily on the palmar surface. When severe, weakness of the thumb with atrophy of the thenar eminence may occur. A positive Phalen test, in which the patient can reproduce the pain by holding the extensor surfaces of the flexed wrists together, is confirmatory of the diagnosis. This condition occurs commonly in those with jobs that involve repetitive wrist movement, such as typing, but can be idiopathic. It commonly develops in patients with obesity and is more common in women. As well, increased plasma volume in pregnancy commonly leads to edema that compresses the median nerve. Nighttime symptoms are frequently encountered, and the initial treatment requires wrist splints worn at night. Splinting reduces the range of motion of the wrist and limits activities that increase pressure within the carpal tunnel. Patients who have persistent or severe symptoms or muscular weakness may require surgical decompression.

Incorrect Answers: B, C, D, and E.

Oral calcium supplements (Choice B) have not been proven to directly treat carpal tunnel or palliate symptoms. They would play no role in the treatment of this patient.



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- ☐ D) Corticosteroid injection
- ☐ E) Release of the median nerve

Correct Answer: A.

Mechanical entrapment of the median nerve leading to carpal tunnel syndrome is the most likely mechanism of this patient's symptoms. The carpal tunnel describes a conduit in the wrist that is formed by the flexor retinaculum anteriorly and the carpal bones posteriorly. Both the median nerve and the flexor tendons of the fingers travel through this canal. Increased pressure in this canal can lead to compression of the median nerve resulting in paresthesias of the first three digits, primarily on the palmar surface. When severe, weakness of the thumb with atrophy of the thenar eminence may occur. A positive Phalen test, in which the patient can reproduce the pain by holding the extensor surfaces of the flexed wrists together, is confirmatory of the diagnosis. This condition occurs commonly in those with jobs that involve repetitive wrist movement, such as typing, but can be idiopathic. It commonly develops in patients with obesity and is more common in women. As well, increased plasma volume in pregnancy commonly leads to edema that compresses the median nerve. Nighttime symptoms are frequently encountered, and the initial treatment requires wrist splints worn at night. Splinting reduces the range of motion of the wrist and limits activities that increase pressure within the carpal tunnel. Patients who have persistent or severe symptoms or muscular weakness may require surgical decompression.

Incorrect Answers: B, C, D, and E.

Oral calcium supplements (Choice B) have not been proven to directly treat carpal tunnel or palliate symptoms. They would play no role in the treatment of this patient.

Oral corticosteroid therapy (Choice C) and release of the median nerve (Choice E) are considered if carpal tunnel syndrome symptoms are refractory to first-line therapies. Oral corticosteroids carry a risk for low birth weight and preterm delivery and are therefore less preferred in pregnant patients.

Corticosteroid injection (Choice D) is sometimes considered a first-line therapy in nonpregnant patients. Though corticosteroid injection is generally considered safe in pregnant patients, wrist splinting carries even less fetal risks and is considered first-line in pregnancy.

Educational Objective: Carpal tunnel syndrome presents with paresthesias of the first three digits, primarily on the palmar surface. Wrist splints are the first-line treatment but surgical intervention and carpal tunnel release may be required in some cases.



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- ✓ 7. A 72-year-old man is brought to the emergency department 30 minutes after the sudden onset of severe chest pain that radiates to his back. Ten years ago, he underwent coronary artery bypass grafting after he sustained a myocardial infarction. Since then, he has had intermittent substernal chest pain. He has hypertension and is not always compliant with his medication regimen. Medications include a nitrate, calcium-channel blocking agent, and β -adrenergic blocking agent. He appears anxious and diaphoretic and is unable to find a comfortable position. His temperature is 37.9°C (100.2°F), pulse is 65/min and regular, respirations are 30/min, and blood pressure is 190/110 mm Hg on the right and 110/80 mm Hg on the left. The lungs are clear to auscultation. No gallops or murmurs are heard. A CT scan of the chest shows an opacification of half of the aortic lumen from just proximal to the origin of the left subclavian artery and extending to the celiac artery distally; there is a thrombus in the aortic false lumen and a left pleural effusion. Which of the following is the most appropriate next step in management?

- ☒ A) Nitroprusside therapy
- ☐ B) Intravenous bolus of tissue plasminogen activator
- ☐ C) Placement of a left chest tube
- ☐ D) Coronary angiography
- ☐ E) Pericardiocentesis
- ☐ F) Thoracentesis

Correct Answer: A.

First-line anti-hypertensive medications used to lower blood pressure and heart rate in the setting of acute aortic dissection include nitroprusside and esmolol, titratable vasodilators and β -adrenergic blockers, respectively. Thoracic aortic dissection can present with chest pain, back pain, hypertension, tachycardia, pulse deficit, and an aortic regurgitation murmur. ECG may show ST-segment elevations if the dissection extends proximally into coronary arteries and a chest x-ray may show a widened mediastinum. CT angiography of the aorta is indicated to diagnose the condition and determine the extent of arterial involvement. It is imperative to treat the patient's hypertension in aortic dissection to prevent the advancement of the dissection flap and resultant occlusion of branch vessels or complications such as aortic rupture or cardiac tamponade. The blood pressure should be rapidly decreased using a β -adrenergic blocker to lower cardiac output and diminish fluctuations in pulse pressure, combined with an α -adrenergic blocker, calcium channel blocker, or arterial vasodilator to lower mean arterial pressure by reducing vascular resistance. Nitroprusside is the most appropriate initial therapy in this case, ideally paired with a β -adrenergic blocker.



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First-line anti-hypertensive medications used to lower blood pressure and heart rate in the setting of acute aortic dissection include nitroprusside and esmolol, titratable vasodilators and β -adrenergic blockers, respectively. Thoracic aortic dissection can present with chest pain, back pain, hypertension, tachycardia, pulse deficit, and an aortic regurgitation murmur. ECG may show ST-segment elevations if the dissection extends proximally into coronary arteries and a chest x-ray may show a widened mediastinum. CT angiography of the aorta is indicated to diagnose the condition and determine the extent of arterial involvement. It is imperative to treat the patient's hypertension in aortic dissection to prevent the advancement of the dissection flap and resultant occlusion of branch vessels or complications such as aortic rupture or cardiac tamponade. The blood pressure should be rapidly decreased using a β -adrenergic blocker to lower cardiac output and diminish fluctuations in pulse pressure, combined with an α -adrenergic blocker, calcium channel blocker, or arterial vasodilator to lower mean arterial pressure by reducing vascular resistance. Nitroprusside is the most appropriate initial therapy in this case, ideally paired with a β -adrenergic blocker.

Incorrect Answers: B, C, D, E, and F.

Intravenous bolus of tissue plasminogen activator (Choice B) is appropriate in certain cases of acute ischemic stroke, acute coronary syndrome, and acute pulmonary embolism. This is not a first-line medication in acute aortic dissection. In the event of aortic rupture, thrombolysis could result in irreversible exsanguination.

Placement of a left chest tube (Choice C) may be necessary in managing a pleural effusion, especially if such an effusion is large, infected, or at risk for infection. This may be necessary in this patient's case, but not prior to immediate management of blood pressure and heart rate to prevent extension of a dissection flap and decrease the risk for aortic rupture. Similarly, thoracentesis (Choice F) is indicated in the management of pleural effusions but not prior to managing the blood pressure and heart rate of a patient with an acute aortic dissection.

Coronary angiography (Choice D) is appropriate in cases of suspected acute coronary syndrome or angina. In this case, the patient has a CT scan showing an acute aortic dissection. Management of blood pressure and heart rate is more appropriate.

Pericardiocentesis (Choice E) is appropriate in the management of cardiac tamponade, or in the evaluation of pericardial effusion. In the case of aortic dissection, if the proximal flap extends to and ruptures into the pericardial space, acute tamponade can result. This patient is not showing signs of cardiac tamponade and has a CT scan showing an aortic dissection distant from the aortic root/pericardial space.

Educational Objective: Thoracic aortic dissection can present with chest pain, back pain, hypertension, tachycardia, pulse deficit, and an aortic regurgitation murmur. Immediate management involves anti-hypertensive medications, such as esmolol and nitroprusside.



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8. A 23-year-old man comes to the emergency department the morning after injuring his finger in a fight at a bar the previous evening. The injury occurred when he punched another patron in the mouth. Review of medical records shows that he underwent emergency laparotomy and splenectomy for trauma at 6 years of age. At that time, his immunizations were up-to-date, including pneumococcal polysaccharide vaccine, 23-valent. He has not seen a physician since then and has been in good health. Examination of the right hand shows a laceration over the right fourth metacarpophalangeal joint. An x-ray shows no abnormalities. In addition to irrigating the wound, the most appropriate treatment is administration of which of the following?
- ☐ A) Intravenous immune globulin
 - ☐ B) Tetanus immune globulin
 - ☒ C) Tetanus toxoid
 - ☐ D) Tetanus toxoid and hyperbaric oxygen
 - ☐ E) Tetanus toxoid and tetanus immune globulin at different sites

Correct Answer: C.

Tetanus toxoid should be administered. For patients presenting to the emergency department with wounds, tetanus vaccination should be administered based on the date of the patient's last vaccination and the characteristics of the wound. For clean, uncontaminated wounds, the patient requires updated tetanus vaccination if it has not been administered within the previous 10 years. For contaminated wounds, updated tetanus vaccination is indicated if it has not been administered within the previous 5 years. This patient has a contaminated wound, and the date of his most recent tetanus vaccination is unknown. Tetanus toxoid vaccination is thus indicated.

Incorrect Answers: A, B, D, and E.

Intravenous immune globulin (IVIG) (Choice A) is indicated in the management of certain immunocompromised states and many immunologically mediated conditions (eg, autoimmune inflammatory demyelinating polyneuropathy). Splenectomy is not an indication for IVIG treatment by itself.

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- ☐ D) Tetanus toxoid and hyperbaric oxygen
- ☒ E) Tetanus toxoid and tetanus immune globulin at different sites

Correct Answer: C.

Tetanus toxoid should be administered. For patients presenting to the emergency department with wounds, tetanus vaccination should be administered based on the date of the patient's last vaccination and the characteristics of the wound. For clean, uncontaminated wounds, the patient requires updated tetanus vaccination if it has not been administered within the previous 10 years. For contaminated wounds, updated tetanus vaccination is indicated if it has not been administered within the previous 5 years. This patient has a contaminated wound, and the date of his most recent tetanus vaccination is unknown. Tetanus toxoid vaccination is thus indicated.

Incorrect Answers: A, B, D, and E.

Intravenous immune globulin (IVIG) (Choice A) is indicated in the management of certain immunocompromised states and many immunologically mediated conditions (eg, autoimmune inflammatory demyelinating polyneuropathy). Splenectomy is not an indication for IVIG treatment by itself.

Tetanus immune globulin (Choice B) and tetanus toxoid and tetanus immune globulin at different sites (Choice E) are incorrect. Tetanus immune globulin is only required for patients who have not received at least three tetanus toxoid vaccines in the past and have a grossly dirty wound. When indicated, tetanus immune globulin should be given at the time of injury.

Tetanus toxoid and hyperbaric oxygen (Choice D) is only partially correct. Tetanus toxoid is indicated; however, hyperbaric oxygen therapy is indicated in the care of nonhealing wounds. This patient should receive regular wound checks to assess for healing.

Educational Objective: For clean, uncontaminated wounds, updated tetanus vaccination is indicated if it has not been administered within the previous 10 years. For contaminated wounds, updated tetanus vaccination is indicated if it has not been administered within the previous 5 years.



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9. A 57-year-old man with chronic hepatitis B comes to the physician because of a 6-month history of bruising of the arms and legs after minor trauma. He appears jaundiced. Examination shows palmar erythema and multiple 5-cm ecchymoses over the upper and lower extremities. No petechiae are seen. The spleen tip is palpated 2 cm below the left costal margin. There is gynecomastia and testicular atrophy. Laboratory studies are most likely to show which of the following sets of values?

	Prothrombin Time	Partial Thromboplastin Time	Platelet Count (/mm ³)
<input checked="" type="radio"/> A)	Increased	increased	80,000
<input type="radio"/> B)	Increased	increased	600,000
<input type="radio"/> C)	Increased	normal	1000
<input type="radio"/> D)	Normal	increased	80,000
<input type="radio"/> E)	Normal	normal	80,000
<input type="radio"/> F)	Normal	normal	300,000

Correct Answer: A.

Cirrhosis may present with edema, ascites, increased bilirubin, jaundice, spider angiomas, palmar erythema, and sequelae of portal hypertension, such as esophageal varices, splenomegaly, caput medusae, rectal varices, and hepatic encephalopathy. It typically occurs in patients with preceding conditions, such as alcohol use disorder or chronic hepatitis. Laboratory values in cirrhosis can show abnormal aminotransferases, hyponatremia, increased bilirubin concentrations, decreased protein and albumin, anemia, thrombocytopenia, and coagulopathy. Coagulopathy results from hepatic synthetic dysfunction of clotting factors. As a result, the prothrombin time, partial thromboplastin time, and INR are often increased. Thrombocytopenia results from portal hypertension causing splenomegaly and sequestration of platelets along with decreased production of thrombopoietin. Platelet counts are usually decreased but are uncommonly below 50,000/mm³. In this case, the laboratory studies show increased prothrombin time, increased partial thromboplastin time, and decreased platelets, which is likely secondary to the patient's chronic hepatitis B and subsequent cirrhosis.

of chronic hepatitis. Laboratory values in cirrhosis can show abnormal aminotransferases, hyponatremia, increased bilirubin concentrations, decreased protein and albumin, anemia, thrombocytopenia, and coagulopathy. Coagulopathy results from hepatic synthetic dysfunction of clotting factors. As a result, the prothrombin time, partial thromboplastin time, and INR are often increased. Thrombocytopenia results from portal hypertension causing splenomegaly and sequestration of platelets along with decreased production of thrombopoietin. Platelet counts are usually decreased but are uncommonly below $50,000/\text{mm}^3$. In this case, the laboratory studies show increased prothrombin time, increased partial thromboplastin time, and decreased platelets, which is likely secondary to the patient's chronic hepatitis B and subsequent cirrhosis.

Incorrect Answers: B, C, D, E, and F.

Choice B correctly identifies an increased prothrombin time and partial thromboplastin time. However, platelet counts are expected to be decreased rather than increased in cases of cirrhosis.

Choice C correctly identifies an increased prothrombin time. However, because of hepatic dysfunction of clotting factor production, increased partial thromboplastin time would be expected as well. Decreased platelet count would be expected but not as significantly as $1000/\text{mm}^3$.

Choices D and E correctly identify a decreased platelet count that may be seen in cases of cirrhosis. However, both the prothrombin time and partial thromboplastin time would likely be increased as a result of dysfunction in creation of liver clotting factors.

Choice F is what may be expected in laboratory studies of a healthy individual. This patient shows signs of cirrhosis with a history of chronic hepatitis B. Laboratory studies consistent with cirrhosis would be more likely.

Educational Objective: Coagulopathy in cirrhosis results from hepatic synthetic dysfunction of clotting factors, which causes an increase in the prothrombin time, partial thromboplastin time, and INR. Thrombocytopenia in cirrhosis results from portal hypertension causing splenomegaly and sequestration of platelets along with decreased production of thrombopoietin.



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✓ 10. A 67-year-old man comes to the physician because of a 1-month history of episodes of light-headedness. He has hypertension and atrial fibrillation. Current medications are lisinopril, atenolol, and apixaban. His temperature is 37.1°C (98.8°F), and respirations are 12/min. While supine, his pulse is 44/min and blood pressure is 124/68 mm Hg; while standing, his pulse is 48/min and blood pressure is 120/64 mm Hg. Cardiac examination shows a slow, irregular heartbeat. Which of the following is the most appropriate next step in management?

- ☐ A) Add dopamine to the regimen
- ☐ B) Add midodrine to the regimen
- ☒ C) Discontinue atenolol therapy
- ☐ D) Discontinue lisinopril therapy
- ☐ E) Discontinue apixaban therapy
- ☐ F) Place a permanent pacemaker

Correct Answer: C.

Discontinue atenolol, a β -adrenergic blocker, is the best next step. This patient presents with episodic light-headedness of a subacute duration, and on examination is found to have bradycardia during orthostatic testing. This is consistent with symptomatic bradycardia. In normal physiology, the autonomic nervous system responds to positional changes that increase demand for cardiac output (such as rising to stand) with an increase in heart rate and vascular resistance. This has the effect of increasing mean arterial pressure through both increases in cardiac output and systemic vascular resistance. β -adrenergic blockers blunt the sympathetic response to position change, reflected in this case as minimal-to-no increase in heart rate with orthostatic testing. If the heart cannot chronotropically increase to meet demand for increased cardiac output, the patient will experience exertional or postural light-headedness. The best next step to resolve this patient's symptoms of symptomatic bradycardia is to discontinue the β -adrenergic blocker or reverse any other triggering causes. After this, the patient's baseline and orthostatic vital signs should be reassessed following a period of washout.

Incorrect Answers: A, B, D, E, and F.

Add dopamine to the regimen (Choice A) is incorrect. Dopamine is a titratable intravenous medication that is used to manage cardiogenic shock through beta agonism. It is



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Discontinue atenolol, a β -adrenergic blocker, is the best next step. This patient presents with episodic light-headedness of a subacute duration, and on examination is found to have bradycardia during orthostatic testing. This is consistent with symptomatic bradycardia. In normal physiology, the autonomic nervous system responds to positional changes that increase demand for cardiac output (such as rising to stand) with an increase in heart rate and vascular resistance. This has the effect of increasing mean arterial pressure through both increases in cardiac output and systemic vascular resistance. β -adrenergic blockers blunt the sympathetic response to position change, reflected in this case as minimal-to-no increase in heart rate with orthostatic testing. If the heart cannot chronotropically increase to meet demand for increased cardiac output, the patient will experience exertional or postural light-headedness. The best next step to resolve this patient's symptoms of symptomatic bradycardia is to discontinue the β -adrenergic blocker or reverse any other triggering causes. After this, the patient's baseline and orthostatic vital signs should be reassessed following a period of washout.

Incorrect Answers: A, B, D, E, and F.

Add dopamine to the regimen (Choice A) is incorrect. Dopamine is a titratable intravenous medication that is used to manage cardiogenic shock through beta agonism. It is only available in the intensive care setting. While it would increase the patient's heart rate, it is also pro-arrhythmic. In the setting of atrial fibrillation, dopamine could worsen existing or provoke new arrhythmia.

Add midodrine to the regimen (Choice B) could be appropriate in cases of orthostatic hypotension not related to β -adrenergic blockade. Midodrine is often used in orthostatic tachycardia syndromes for which increasing vascular tone or intravascular volume improves resultant tachycardia or hypotension. Discontinuation of the β -adrenergic blocker is most appropriate as a first step in this case.

Discontinue lisinopril therapy (Choice D) could be appropriate in cases of hypotension; however, this patient has persistent symptomatic bradycardia. Lisinopril, an ACE inhibitor, directly affects vascular tone, whereas atenolol, a β -adrenergic blocker, affects heart rate.

Discontinue apixaban therapy (Choice E) is inappropriate. Apixaban, a direct oral anticoagulant, decreases the likelihood of thrombus formation in atrial fibrillation. This minimizes the risk for cerebrovascular accident, limb ischemia, mesenteric ischemia, and other thromboembolic complications.

Place a permanent pacemaker (Choice F) may be a suitable option after discontinuation of atenolol if the patient continues to have symptomatic bradycardia. For now, discontinuation of potentially offending medications carries minimal risk, whereas placement of a pacemaker requires operative risk.

Educational Objective: Symptomatic bradycardia leading to orthostatic light-headedness is best managed first through treating any reversible causes, such as discontinuing culprit medications. After this, the patient's baseline and orthostatic vital signs should be reassessed following a period of washout.

✓ 11. A 57-year-old man comes to the physician because of a 1-year history of an enlarging painless lesion on his nose. The lesion sometimes bleeds when he washes his face. He has no history of serious illness and takes no medications. His temperature is 36.8°C (98.2°F), pulse is 84/min, respirations are 16/min, and blood pressure is 128/78 mm Hg. Examination shows the lesion in the photograph and no other abnormalities. Which of the following is the most likely diagnosis?

- ☐ A) Amelanocytic melanoma
- ☒ B) Basal cell carcinoma
- ☐ C) Dysplastic nevus
- ☐ D) Rhinophyma
- ☐ E) Sebaceous hypertrophy
- ☐ F) Squamous cell carcinoma



Correct Answer: B.

This patient's lesion is consistent with basal cell carcinoma. Basal cell carcinoma is the most common subtype of skin cancer and is associated with UV light exposure. Basal cell carcinoma clinically presents as a pearly papule with rolled borders, overlying telangiectasia, and may include areas of erosion or ulceration. Patients often describe basal cell carcinoma as a pimple that will not pop or a wound that will not heal. Basal cell carcinoma can be locally invasive, but distant metastasis is rare.



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12. A 27-year-old primigravid woman at 11 weeks' gestation comes to the emergency department because of severe cramps and heavy bleeding for 3 hours. A fetal demise was diagnosed 1 week ago. Her blood group is A, Rh-positive. Vital signs are within normal limits. A clot containing a 4-cm sac surrounded by a placenta and a 1-cm embryo is removed from the vaginal canal. The cervix is closed, and there is no bleeding. The uterus is firm and consistent in size with a 6-week gestation. Which of the following is the most appropriate next step in management?

- ☒ A) Second examination in 1 week
- ☐ B) Endovaginal ultrasonography in 1 week
- ☐ C) Intramuscular administration of methotrexate
- ☐ D) Intramuscular administration of Rh_o(D) immune globulin
- ☐ E) Suction curettage

Correct Answer: A.

Spontaneous abortion describes the noninduced loss of a fetus prior to 20 weeks' gestation, and is subdivided into threatened, inevitable, incomplete, complete, missed, and septic abortion. Threatened abortion presents with vaginal bleeding without an open os or the loss of products of conception. Inevitable abortion presents with vaginal bleeding and an open os and is referred to as an incomplete abortion once the partial passage of products begins. Complete abortion refers to the passage of all products and a closed os, consistent with this patient's presentation. Missed abortion refers to asymptomatic fetal demise without the passage of products. Following a spontaneous abortion, it is critical to have a follow-up examination in a short interval of time, such as 1 week, to ensure there is no evidence of retained products of conception, and to overall assess the well-being of the patient. If the patient presents with continued bleeding, retained products of conception can be assessed with ultrasonography.

Incorrect Answers: B, C, D, and E.

Endovaginal ultrasonography in 1 week (Choice B) is not necessary in all cases of spontaneous abortion. An initial follow-up examination is necessary to assess the well-being of the patient. If the patient presents with features of retained products of conception (eg, bleeding, pelvic pain), then ultrasonography of the pelvis should be performed.



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Correct Answer: A.

Spontaneous abortion describes the noninduced loss of a fetus prior to 20 weeks' gestation, and is subdivided into threatened, inevitable, incomplete, complete, missed, and septic abortion. Threatened abortion presents with vaginal bleeding without an open os or the loss of products of conception. Inevitable abortion presents with vaginal bleeding and an open os and is referred to as an incomplete abortion once the partial passage of products begins. Complete abortion refers to the passage of all products and a closed os, consistent with this patient's presentation. Missed abortion refers to asymptomatic fetal demise without the passage of products. Following a spontaneous abortion, it is critical to have a follow-up examination in a short interval of time, such as 1 week, to ensure there is no evidence of retained products of conception, and to overall assess the well-being of the patient. If the patient presents with continued bleeding, retained products of conception can be assessed with ultrasonography.

Incorrect Answers: B, C, D, and E.

Endovaginal ultrasonography in 1 week (Choice B) is not necessary in all cases of spontaneous abortion. An initial follow-up examination is necessary to assess the well-being of the patient. If the patient presents with features of retained products of conception (eg, bleeding, pelvic pain), then ultrasonography of the pelvis should be performed.

Intramuscular administration of methotrexate (Choice C) can be used for the treatment of small, early ectopic pregnancies with no evidence of complication or rupture. This would not be an appropriate treatment for a patient presenting with signs of a complete abortion.

Intramuscular administration of Rh₀(D) immune globulin (Choice D) is not appropriate for this patient since she is Rh-positive. In a patient who is Rh-negative, the immunoglobulin is necessary in times of concern for maternal-fetal blood mixing. This is of no concern in this patient because of her positive antigen status.

Suction curettage (Choice E) would only be necessary if the patient presented with evidence of retained products of conception on follow-up examination. This patient is presenting with signs of a complete abortion with no evidence of complication or continued bleeding. Follow-up examination in 1 week is the most appropriate next step for this patient.

Educational Objective: Spontaneous abortion describes the noninduced loss of a fetus prior to 20 weeks' gestation, and is subdivided into threatened, inevitable, incomplete, complete, missed, and septic abortion. Complete abortion refers to the passage of all products and a closed os. Following a spontaneous abortion, it is critical to have a follow-up examination in a short interval of time, such as 1 week, to ensure there is no evidence of retained products of conception, and to assess the well-being of the patient.



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- ✓ 13. A recent cross-sectional study showed that the prevalence of autism spectrum disorder (ASD) in children between the ages of 6 and 17 years in the United States increased from 6.7 per 1000 children to 11.3 per 1000 children during the past 10 years. Data were collected from 40 state registries. Which of the following is the most likely cause of this increased prevalence?
- ☐ A) Decreased diagnosis of children aged 13 to 17 years with ASD
 - ☒ B) Earlier recognition of ASD among children aged 2 to 6 years
 - ☐ C) Improved treatment for children with ASD resulting in some children no longer meeting ASD diagnostic criteria
 - ☐ D) More specific criteria for diagnosing ASD in children

Correct Answer: B.

Prevalence defines the total number of cases of a disease or condition as a fraction of a population at a certain point in time. In contrast, incidence is the number of new cases that develop during a specified period of time. In this example, the prevalence of autism spectrum disorder (ASD) in children between the ages of 6 and 17 years would be increased with earlier diagnosis of the condition among children aged 2 to 6 years. In contrast, the incidence of children diagnosed with ASD between the ages of 6 and 17 years would likely be decreased with earlier recognition.

Incorrect Answers: A, C, and D.

Decreased diagnosis of children aged 13 to 17 years with ASD (Choice A) would not likely cause an increase in prevalence. A decreased prevalence would likely be expected due to decreased diagnosis.

Improved treatment for children with ASD resulting in some children no longer meeting ASD diagnostic criteria (Choice C) would not likely cause an increased prevalence. With a lower number of children meeting the ASD diagnostic criteria, the prevalence would likely decrease.

More specific criteria for diagnosing ASD in children (Choice D) would not likely increase the prevalence in this example. More specific criteria would likely cause a lower number of children to be diagnosed with ASD, thus resulting in a lower prevalence.



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14. A 32-year-old woman is brought to the emergency department immediately after she was involved in a motor vehicle collision. She was the restrained driver, and her vehicle was struck on its left side by a van. Air bags were deployed on impact. At the scene, her spine was immobilized with a cervical collar, and her head was taped to a backboard. En route to the hospital, 250 mL of intravenous lactated Ringer solution was administered, and administration of oxygen (4 L/min) by nasal cannula was begun. On arrival, she is alert and says she has pain in her left arm, left lower abdomen, and left flank. Her pulse is 128/min, respirations are 18/min, and blood pressure is 90/55 mm Hg. Pulse oximetry on 4 L/min of oxygen by nasal cannula shows an oxygen saturation of 95%. Breath sounds are normal. Examination shows a large hematoma over the left upper extremity, including the left shoulder. There is severe tenderness of the left lower quadrant of the abdomen and mild tenderness over the suprapubic region. X-rays of the cervical spine, chest, and pelvis show a diastasis of the pubic symphysis with widening of the left sacroiliac joint. Insertion of a urinary catheter yields 150 mL of grossly bloody urine. Her hemoglobin concentration is 12.4 g/dL, hematocrit is 37%, and leukocyte count is 11,800/mm³. Which of the following is the most appropriate next step in management?

- ☐ A) Focused abdominal ultrasonography for trauma (FAST)
- ☐ B) CT scan of the abdomen
- ☒ C) Intravenous administration of 2 L of 0.9% saline
- ☐ D) Transfusion of packed red blood cells
- ☐ E) Application of a pelvic external fixator

Correct Answer: C.

This patient presents after experiencing blunt trauma with signs of hemorrhagic shock including tachycardia and hypotension. Her clinical examination shows an extremity hematoma and signs of blunt abdominal trauma (BAT). Imaging findings suggest a pelvic fracture, with separation of the symphysis and widening of the left sacroiliac joint. Pelvic fractures are often associated with significant intrapelvic bleeding due to the close anatomic relation of pelvic vasculature and organs within the bony pelvic ring. BAT is also commonly associated with injury involving the liver, spleen, and kidneys, and can include hematomas, contusions, lacerations, and in severe cases, devascularization and uncontrolled hemorrhage in these areas as well. Hematuria is suggestive of renal, retroperitoneal, or pelvic bleeding, or hematoma. Hemodynamically unstable patients with blunt trauma require stabilization in tandem with diagnostic testing. For this patient, the most appropriate next step is to first initiate restoration of circulating volume with intravenous administration of 2 L of 0.9% saline before conducting additional diagnostic and therapeutic measures. This will temporize bleeding that is occurring in the pelvis and extremity hematoma.



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This patient presents after experiencing blunt trauma with signs of hemorrhagic shock including tachycardia and hypotension. Her clinical examination shows an extremity hematoma and signs of blunt abdominal trauma (BAT). Imaging findings suggest a pelvic fracture, with separation of the symphysis and widening of the left sacroiliac joint. Pelvic fractures are often associated with significant intrapelvic bleeding due to the close anatomic relation of pelvic vasculature and organs within the bony pelvic ring. BAT is also commonly associated with injury involving the liver, spleen, and kidneys, and can include hematomas, contusions, lacerations, and in severe cases, devascularization and uncontrolled hemorrhage in these areas as well. Hematuria is suggestive of renal, retroperitoneal, or pelvic bleeding, or hematoma. Hemodynamically unstable patients with blunt trauma require stabilization in tandem with diagnostic testing. For this patient, the most appropriate next step is to first initiate restoration of circulating volume with intravenous administration of 2 L of 0.9% saline before conducting additional diagnostic and therapeutic measures. This will temporize bleeding that is occurring in the pelvis and extremity hematoma.

Incorrect Answers: A, B, D, and E.

Focused abdominal ultrasonography for trauma (FAST) (Choice A), or focused assessment with sonography for trauma, is the appropriate initial imaging study for unstable BAT. If the FAST is positive for free fluid (suggestive of blood), an exploratory laparotomy is indicated. In this case, the patient requires a FAST examination; however, her hemodynamic instability must first be addressed to prevent further decompensation.

CT scan of the abdomen (Choice B) is appropriate in cases of stable BAT. In such cases, clinical stability permits time for thorough evaluation and the additional detail offered in a CT scan. This patient is hemodynamically unstable with signs of hematoma and pelvic fracture. She merits treatment with crystalloid in 0.9% saline and subsequent FAST examination instead.

Transfusion of packed red blood cells (Choice D) is the next appropriate step after crystalloid fluid resuscitation if a bleeding patient remains hemodynamically unstable. Clinical practice on when to initiate blood transfusion varies, with some centers initiating it after 1 L (not 2 L) of intravenous crystalloid. Crystalloid resuscitation, via 0.9% saline in this case, should occur first.

Application of a pelvic external fixator (Choice E) is necessary in this case; however, restoration of intravascular volume is the most important next step. Application of a pelvic fixator would occur after initiation of fluid resuscitation to prevent clinical decompensation.

Educational Objective: Blunt trauma patients who are hemodynamically unstable require stabilization prior to initiation of further diagnostic steps. Fluid resuscitation for suspected hemorrhage generally begins with crystalloid administration, with continued resuscitation using blood products if hemodynamic stability is not restored or maintained.



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- ✓ 15. A patient is scheduled to undergo a hemivulvectomy for squamous cell carcinoma. Prior to the procedure, a written time-out verification is required as part of hospital protocol. Which of the following must be recorded on the time-out verification?
- ☒ A) Anatomic location of the procedure
 - ☐ B) Estimated length of time of the procedure
 - ☐ C) Name of circulating nurse
 - ☐ D) Position of the patient
 - ☐ E) Type of anesthetic

Correct Answer: A.

Because of historic wrong-site procedures, The Joint Commission devised the universal protocol. This protocol includes time-outs before any surgical procedure. During time-outs, all operating room staff stop what they are doing, and one staff member verbally reviews the patient's name, the procedure, and the anatomic location of the procedure. During the time-out, staff members can share any concerns about patient safety.

Incorrect Answers: B, C, D, and E.

Estimated length of time of the procedure (Choice B) and name of circulating nurse (Choice C) are not directly relevant to patient safety and are therefore not reviewed during time-outs.

Position of the patient (Choice D) and type of anesthetic (Choice E), though related to patient safety, are not as important to review as the anatomic location of the procedure to prevent wrong-site procedures.

Educational Objective: Time-outs were developed to prevent wrong-site procedures. Time-outs involve reviewing the patient's name, the procedure, and the anatomic location of the procedure.

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✓ 16. A 37-year-old woman, gravida 1, para 1, comes to the physician for a postpartum examination 4 weeks after delivery of a 3500-g (7-lb 12-oz) male newborn at term. She received no prenatal care. Prior to delivery, her blood group was determined to be A, Rh-negative; results of other laboratory studies were within the reference ranges. She has no history of serious illness or operative procedures. At today's visit, no documentation is found of postpartum administration of Rh_o(D) immune globulin, and she says that she does not recall receiving any injections. Repeat blood group determination and red blood cell antibody titer confirm blood group and lack of RBC antibodies, and she is given Rh_o(D) immune globulin. Which of the following is the most appropriate classification of this medical error?

- ☐ A) Adverse outcome
- ☒ B) Near miss
- ☐ C) Nondisclosure
- ☐ D) Variation in utilization

Correct Answer: B.

This patient should have been administered Rh_o(D) immune globulin shortly after delivery to prevent isoimmunization (antibody production against Rh-positive blood cells) and consequent fetal hemolytic disease in future pregnancies; however, she was not administered this injection. Fortunately, isoimmunization did not occur as evidenced by the absence of RBC antibodies. Thus, omitting the injection, likely secondary to a medical error, could have led to an adverse event but did not due to chance. A near miss is an act or omission (eg, a medical error) that could have caused patient harm (ie, an adverse event) but did not as a result of chance or preventive measures. Hospital safety reporting systems are typically confidential and nonpunitive systems for tracking and analyzing quality and patient safety issues and assisting with devising improvements. Reportable events include medical errors that lead to near misses or adverse events.

Incorrect Answers: A, C, and D.

Adverse outcome (Choice A) is defined as an act or omission that leads to patient harm. No harm occurred to this patient or her potential future newborns.

Nondisclosure (Choice C) of medical errors is a violation of both ethics and a requirement by The Joint Commission. There is no evidence to suggest that the physician is not planning to disclose the omitted Rh_o(D) immune globulin injection to this patient.

✓ 17. A 16-year-old patient comes to the physician because she is concerned she may be pregnant. She has been sexually active with several male partners; her partners use condoms inconsistently. On questioning, she states that she has not had diarrhea or abdominal pain. Her last menstrual period was 10 weeks ago. She has celiac disease well controlled with diet. She does not smoke cigarettes and rarely drinks alcohol. Her diet consists of mostly meat, some dairy products, corn, potatoes, soda, and juice. She does not eat bread or pasta, does not drink milk, and rarely eats fruits or leafy vegetables. She appears pale. She is 162 cm (5 ft 4 in) tall and weighs 50 kg (110 lb); BMI is 19 kg/m². Her blood pressure is 110/70 mm Hg. Examination shows warm skin. The thyroid gland is mildly enlarged. Cardiac examination shows no abnormalities. The abdomen is soft. Deep tendon reflexes are brisk. Laboratory studies show:

Hemoglobin	10 g/dL
Mean corpuscular volume	110 μm ³
Serum	
Thyroid-stimulating hormone	0.9 μU/mL
Thyroxine (T ₄)	18 μg/dL

An anti-endomysial antibody test and a urine pregnancy test are positive. This patient's fetus is at increased risk for which of the following?

- ☐ A) Cleft lip and palate
- ☐ B) Congenital hypothyroidism
- ☐ C) Fetal alcohol syndrome
- ☐ D) Neonatal Graves disease
- ☒ E) Neural tube defects

Correct Answer: E.

This patient presents with risk factors for folic acid deficiency, along with laboratory studies suggestive of macrocytic anemia. Folic acid deficiency is the most common risk

☒ E) Neural tube defects

Correct Answer: E.

This patient presents with risk factors for folic acid deficiency, along with laboratory studies suggestive of macrocytic anemia. Folic acid deficiency is the most common risk factor for the development of neural tube defects. Risk factors for the development of folic acid deficiency include malnutrition, pregnancy, celiac disease, other malabsorptive states, alcohol use disorder, and use of folic acid antagonist medications. Given that this patient is now toward the end of her first trimester, the addition of folic acid supplementation will unfortunately not provide any benefit in reducing the likelihood of neural tube defects. However, folic acid should still be given to this patient for the treatment of her macrocytic anemia. Folic acid should be continued through the end of this patient's pregnancy but may also be continued indefinitely depending on the course of her anemia. Folic acid supplementation is recommended as a part of normal prenatal care for all pregnant patients.

Incorrect Answers: A, B, C, and D.

Cleft lip and palate (Choice A) may occur in either complete (extending through the nares) or incomplete (not involving the nares) fashion and may occur unilaterally or bilaterally. Cleft lip and palate occur as isolated developmental anomalies or in the setting of chromosomal abnormalities (eg, Patau syndrome/trisomy 13) or syndromes of midfacial hypoplasia (eg, Treacher Collins syndrome).

Congenital hypothyroidism (Choice B) commonly presents in the first few months of life with feeding difficulties, lethargy, constipation, myxedematous facies, macroglossia, large fontanelles, hypotonia, and hypothermia. Infants with this disorder may also present with goiter, or congenital cardiac, renal, or gastrointestinal malformations. Thyroid dysfunction can be caused by a variety of mechanisms, including thyroid dysgenesis, resistance to TSH, abnormalities in thyroid hormone transport, iodine deficiency, maternal antibodies, or antithyroid medications. This patient's TSH concentration is within normal limits.

Fetal alcohol syndrome (Choice C) presents with craniofacial dysmorphism (eg, smooth philtrum, narrow palpebral fissures), microcephaly, developmental delay, and learning disabilities. This patient rarely drinks alcohol, making fetal alcohol syndrome unlikely.

Neonatal Graves disease (Choice D) refers to hyperthyroidism in infants born to mothers with Graves disease. This patient has a normal TSH concentration, suggesting she has normal thyroid function, not hyperthyroidism. Thyroxine concentrations fluctuate during pregnancy and are not as good of an indicator of thyroid function due to



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- ✓ 18. A 27-year-old woman comes to the physician because of progressive hair loss and decreased sense of taste during the past 2 months. She is otherwise asymptomatic. She and her brother have hepatolenticular degeneration (Wilson disease); her only medication is penicillamine. She is allergic to nuts but has no known drug allergies. She does not smoke cigarettes or drink alcohol. She is sexually active with one male partner; they use condoms inconsistently. She maintains a vegetarian diet. Vital signs are within normal limits. Examination shows diffuse alopecia. Examination of the mouth and tongue shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) Measurement of serum copper concentration
 - ☐ B) Measurement of serum estrogen concentration
 - ☐ C) Measurement of serum iron concentration
 - ☒ D) Measurement of serum zinc concentration
 - ☐ E) Serum antinuclear antibody assay

Correct Answer: D.

Zinc deficiency can present with a variety of symptoms including decreased growth velocity, delayed sexual maturation, alopecia, dysgeusia or impaired taste, immune dysfunction, impaired wound healing, skin lesions, and hair changes. Dietary sources of zinc include meat, chicken, nuts, and lentils. Zinc is mainly absorbed in the duodenum and jejunum with most zinc excretion occurring through the gastrointestinal tract. The patient in this case is presenting with many symptoms of zinc deficiency, making measurement of serum zinc concentration the most appropriate next step in diagnosis. Penicillamine, in this case used to manage Wilson disease, is likely chelating zinc and causing increased losses of dietary zinc, which may already be low due to a vegetarian diet and nut allergy.

Incorrect Answers: A, B, C, and E.

Measurement of serum copper concentration (Choice A) would be a reasonable next step in diagnosis for suspected copper deficiency. Copper deficiency may present with symptoms such as fragile hair, skin depigmentation, weakness, hepatosplenomegaly, osteoporosis, neuropathy, and ataxia. The symptoms presented in this case are more consistent with a zinc deficiency.

Measurement of serum estrogen concentration (Choice B) may be a reasonable diagnostic step in cases of suspected primary ovarian insufficiency. Symptoms may



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☒ D) Measurement of serum zinc concentration☐ E) Serum antinuclear antibody assay

Correct Answer: D.

Zinc deficiency can present with a variety of symptoms including decreased growth velocity, delayed sexual maturation, alopecia, dysgeusia or impaired taste, immune dysfunction, impaired wound healing, skin lesions, and hair changes. Dietary sources of zinc include meat, chicken, nuts, and lentils. Zinc is mainly absorbed in the duodenum and jejunum with most zinc excretion occurring through the gastrointestinal tract. The patient in this case is presenting with many symptoms of zinc deficiency, making measurement of serum zinc concentration the most appropriate next step in diagnosis. Penicillamine, in this case used to manage Wilson disease, is likely chelating zinc and causing increased losses of dietary zinc, which may already be low due to a vegetarian diet and nut allergy.

Incorrect Answers: A, B, C, and E.

Measurement of serum copper concentration (Choice A) would be a reasonable next step in diagnosis for suspected copper deficiency. Copper deficiency may present with symptoms such as fragile hair, skin depigmentation, weakness, hepatosplenomegaly, osteoporosis, neuropathy, and ataxia. The symptoms presented in this case are more consistent with a zinc deficiency.

Measurement of serum estrogen concentration (Choice B) may be a reasonable diagnostic step in cases of suspected primary ovarian insufficiency. Symptoms may include change in menstrual cycles, hot flashes, vaginal dryness, and osteoporosis. Zinc deficiency is more consistent with the symptoms presented in this case.

Measurement of serum iron concentration (Choice C) may be a reasonable step in diagnosis for suspected iron deficiency. Symptoms may include fatigue, headache, pica, weakness, restless legs, and headache. The symptoms presented in this case are more consistent with a zinc deficiency.

Serum antinuclear antibody assay (Choice E) may be a reasonable step in diagnosis for suspected lupus or other autoimmune disease. This patient has symptoms more consistent with a zinc deficiency.

Educational Objective: Zinc deficiency may present with many symptoms including decreased growth velocity, delayed sexual maturation, alopecia, dysgeusia or impaired taste, immune dysfunction, impaired wound healing, skin lesions, and hair changes. Dietary sources of zinc include chicken, meat, nuts, and lentils.



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19. A 28-year-old man with sickle cell disease is brought to the emergency department because of a 4-hour history of shortness of breath and increasingly severe chest pain. He has not had cough, fever, or chills. During the past 5 years, he has been hospitalized approximately twice yearly for treatment of sickle cell disease crises. He takes oxycodone to control pain. Last night, he drank four 12-oz beers. Typically, he drinks one 12-oz beer weekly. He smokes cigarettes only when he drinks beer. He appears to be in respiratory distress and in pain. His temperature is 37.2°C (99°F), pulse is 112/min, respirations are 30/min, and blood pressure is 144/88 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 85%. Examination shows conjunctival icterus and pale mucous membranes. The lungs are clear to auscultation. On cardiac examination, no murmurs are heard. Laboratory studies show:

Hemoglobin	6 g/dL
Hematocrit	19%
Leukocyte count	14,000/mm ³
Segmented neutrophils	80%
Lymphocytes	18%
Monocytes	2%
Platelet count	300,000/mm ³

A chest x-ray shows consolidation of the right middle and lower lobes. In addition to administration of 0.9% saline, hydromorphone, antibiotics, and oxygen, which of the following is the most appropriate next step in management?

- ☒ A) Exchange transfusion
- ☐ B) High-dose prednisone therapy
- ☐ C) Hydroxyurea therapy
- ☐ D) Incentive spirometry
- ☐ E) Nebulized albuterol

Correct Answer: A.

- ☒ A) Exchange transfusion
- ☐ B) High-dose prednisone therapy
- ☐ C) Hydroxyurea therapy
- ☐ D) Incentive spirometry
- ☐ E) Nebulized albuterol

Correct Answer: A.

Acute chest syndrome (ACS) occurs because of vaso-occlusion within the pulmonary microvasculature and is diagnosed in patients with sickle cell disease (SCD) who present with a new pulmonary infiltrate in the setting of fever or other new respiratory symptoms, including cough, shortness of breath, increased work of breathing, tachypnea, or hypoxemia. ACS is a leading cause of mortality in patients with SCD. It is commonly precipitated by another illness, such as bacterial or viral pneumonia, asthma exacerbation, fat emboli, or other vaso-occlusive triggering processes (eg, dehydration, hypoxemia, acidosis). X-ray typically shows segmental or subsegmental consolidation with predilection for involvement of the lower lobes. Beyond treatment with antibiotics, oxygen, analgesics, and fluids, exchange transfusion is indicated in emergency management of ACS. Exchange transfusion involves removing blood from the patient's circulation and replacing it with donor blood. This removes cells affected by SCD and replaces them with normal red blood cells that will not adopt sickled morphology and therefore not aggregate and occlude microvasculature. Exchange transfusion is reserved for treating life-threatening complications of SCD, including ACS, cerebrovascular accidents (eg, stroke), multisystem-organ failure/ischemia, mesenteric ischemia, or other occlusive thromboembolic disease.

Incorrect Answers: B, C, D, and E.

High-dose prednisone therapy (Choice B) is often used in the management of respiratory failure from asthma, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, vasculitis, and certain other infectious/inflammatory conditions. Steroids have not been shown to improve outcomes in ACS recommendations and studies remain mixed.

Hydroxyurea therapy (Choice C) is indicated in the management of SCD to increase circulating fetal hemoglobin and prevent sickle cell crises; however, it does not reverse the effect of existing crises and complications, such as ACS. Exchange transfusion is the most appropriate next step.



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Acute chest syndrome (ACS) occurs because of vaso-occlusion within the pulmonary microvasculature and is diagnosed in patients with sickle cell disease (SCD) who present with a new pulmonary infiltrate in the setting of fever or other new respiratory symptoms, including cough, shortness of breath, increased work of breathing, tachypnea, or hypoxemia. ACS is a leading cause of mortality in patients with SCD. It is commonly precipitated by another illness, such as bacterial or viral pneumonia, asthma exacerbation, fat emboli, or other vaso-occlusive triggering processes (eg, dehydration, hypoxemia, acidosis). X-ray typically shows segmental or subsegmental consolidation with predilection for involvement of the lower lobes. Beyond treatment with antibiotics, oxygen, analgesics, and fluids, exchange transfusion is indicated in emergency management of ACS. Exchange transfusion involves removing blood from the patient's circulation and replacing it with donor blood. This removes cells affected by SCD and replaces them with normal red blood cells that will not adopt sickled morphology and therefore not aggregate and occlude microvasculature. Exchange transfusion is reserved for treating life-threatening complications of SCD, including ACS, cerebrovascular accidents (eg, stroke), multisystem-organ failure/ischemia, mesenteric ischemia, or other occlusive thromboembolic disease.

Incorrect Answers: B, C, D, and E.

High-dose prednisone therapy (Choice B) is often used in the management of respiratory failure from asthma, chronic obstructive pulmonary disease (COPD), pulmonary fibrosis, vasculitis, and certain other infectious/inflammatory conditions. Steroids have not been shown to improve outcomes in ACS recommendations and studies remain mixed.

Hydroxyurea therapy (Choice C) is indicated in the management of SCD to increase circulating fetal hemoglobin and prevent sickle cell crises; however, it does not reverse the effect of existing crises and complications, such as ACS. Exchange transfusion is the most appropriate next step.

Incentive spirometry (Choice D) is appropriate in the management of ACS and many other pulmonary conditions, such as rib fractures and pneumonia. However, it does not reverse the effect of sickle cell crises and complications, such as ACS. Exchange transfusion is the most appropriate next step.

Nebulized albuterol (Choice E) is appropriate in the management of ACS triggered by asthma or chronic obstructive pulmonary disease, however, there is no indication that such conditions precipitated this patient's exacerbation. Further, albuterol does not reverse or remove sickled erythrocytes from circulation, thus, exchange transfusion is the most appropriate next step.

Educational Objective: Exchange transfusion involves removing blood from the patient's circulation and replacing it with donor blood. In patients with sickle cell disease, this technique replaces sickled cells with healthy cells, treating emergent vaso-occlusive complications, such as acute chest syndrome, ischemic stroke, or organ failure.



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20. A 52-year-old woman comes to the physician as a new patient because of a 5-day history of temperatures to 38.2°C (100.8°F) and cough productive of thick, gray-green sputum. She says the sputum is difficult to cough up. During the past 15 years, she has had similar symptoms twice yearly, which resolved after treatment with antibiotics. Because of lack of insurance during this time, she was treated at urgent care clinics. She has no known allergies and no history of serious illness. Her only medication is an over-the-counter cough suppressant. She does not smoke cigarettes or use illicit drugs. She drinks three glasses of wine weekly. She is 170 cm (5 ft 7 in) tall and weighs 91 kg (200 lb); BMI is 31 kg/m². Her temperature is 38°C (100.4°F), pulse is 80/min, and blood pressure is 138/84 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 94%. On pulmonary examination, there is an increased expiratory phase; rhonchi and faint wheezes are heard bilaterally. A CT scan of the chest is shown. Which of the following is the most likely diagnosis?

- ☐ A) Asthma
- ☒ B) Bronchiectasis
- ☐ C) Idiopathic pulmonary fibrosis
- ☐ D) Primary pulmonary hypertension
- ☐ E) Pulmonary embolism
- ☐ F) Tuberculosis

Correct Answer: B.

Bronchiectasis refers to irreversible, abnormal dilatation and thickening of the bronchi that results from recurrent necrotizing infections and chronic inflammation. Patients typically present with frequent cough, excessive sputum production, and frequent respiratory exacerbations. Narrow and obstructed airways result in wheezing on pulmonary auscultation. They often have a history of recurrent episodes of pneumonia in childhood and adolescence. Conditions associated with bronchiectasis include chronic bronchial obstruction, cystic fibrosis, primary immunodeficiency disorders, Kartagener syndrome (primary ciliary dyskinesia), and allergic bronchopulmonary aspergillosis, as well as tobacco use disorder. Chest CT scan is used to confirm the diagnosis. Management consists of identification and treatment of the underlying disorder, airway clearance techniques (including chest physiotherapy, expectorants, and bronchodilators), and antibiotics for acute exacerbations.

Incorrect Answers: A, C, D, E, and F



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Bronchiectasis refers to irreversible, abnormal dilatation and thickening of the bronchi that results from recurrent necrotizing infections and chronic inflammation. Patients typically present with frequent cough, excessive sputum production, and frequent respiratory exacerbations. Narrow and obstructed airways result in wheezing on pulmonary auscultation. They often have a history of recurrent episodes of pneumonia in childhood and adolescence. Conditions associated with bronchiectasis include chronic bronchial obstruction, cystic fibrosis, primary immunodeficiency disorders, Kartagener syndrome (primary ciliary dyskinesia), and allergic bronchopulmonary aspergillosis, as well as tobacco use disorder. Chest CT scan is used to confirm the diagnosis. Management consists of identification and treatment of the underlying disorder, airway clearance techniques (including chest physiotherapy, expectorants, and bronchodilators), and antibiotics for acute exacerbations.

Incorrect Answers: A, C, D, E, and F.

Asthma (Choice A) is a reversible airflow obstruction that typically presents with shortness of breath, tachycardia, tachypnea, hypoxia, poor air movement, wheezing, and accessory muscle use. Chest imaging is generally normal.

Idiopathic pulmonary fibrosis (Choice C) typically presents in older patients with exertional dyspnea and chronic cough. Physical examination may show inspiratory crackles, and chest imaging may show honeycombing. Given this patient's history of recurrent respiratory infections and lack of honeycombing on CT scan, bronchiectasis is more likely.

Primary pulmonary hypertension (Choice D) generally presents with shortness of breath, chest discomfort on exertion, and signs of right-sided heart failure (eg, edema, hepatomegaly, jugular venous distention). Pulmonic or tricuspid murmurs may be heard, especially a loud P₂, and tricuspid regurgitation.

Pulmonary embolism (Choice E) classically presents with pleuritic chest pain, dyspnea, and hemoptysis if infarcted, often in the setting of immobilization, hypercoagulability, and a possible known deep venous thrombosis. Vital signs may show tachycardia, tachypnea, and/or hypoxia, and, if sufficiently large, hypotension. CT angiography would show an embolus or multiple emboli, which are not seen in this patient's scan.

Tuberculosis (Choice F) often presents with pulmonary symptoms, including chronic cough, and systemic symptoms such as fever, night sweats, and weight loss/cachexia in patients with risk factors for tuberculosis. Patients at risk often live in endemic areas, reside in congregate living settings, or are immunocompromised. Imaging would show a cavitary lesion or commonly a pleural effusion, both of which are not seen in this patient.



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- ✓ 21. A 37-year-old man comes to the physician because of a 1-month history of increased thirst, frequent urination, and fatigue. He has a 20-year history of alcohol use disorder and has had multiple episodes of pancreatitis during the past 10 years. He began pancreatic enzyme replacement therapy 5 years ago. An abdominal x-ray 1 year ago showed calcifications within the pancreas. He is 175 cm (5 ft 9 in) tall and weighs 59 kg (130 lb); BMI is 19 kg/m². Vital signs are within normal limits. Examination shows no abnormalities. His serum glucose concentration is 288 mg/dL. Which of the following is the most appropriate pharmacotherapy?
- ☐ A) Acarbose
 - ☐ B) Glipizide
 - ☒ C) Insulin
 - ☐ D) Metformin
 - ☐ E) Repaglinide

Correct Answer: C.

Adult-onset type 1 diabetes mellitus in the setting of recurrent pancreatitis is a clinically intricate condition marked by pancreatic inflammation precipitating the destruction of β cells and subsequent insulin deficiency. Recurrent pancreatitis, often attributable to factors such as chronic alcohol consumption, gallstones, or autoimmune processes, inflicts damage on the pancreas, impeding its capacity for insulin production. Unlike type 2 diabetes characterized by insulin resistance, type 1 diabetes arises from assault on pancreatic β cells, culminating in absolute insulin deficiency. Treatment mandates a comprehensive approach encompassing insulin therapy to offset β -cell dysfunction, alongside addressing underlying pancreatitis causes to forestall further pancreatic compromise. Vigilant monitoring for complications, notably diabetic ketoacidosis and further pancreatic insufficiency, which is seen in this patient, is essential.

Incorrect Answers: A, B, D, and E.

Acarbose (Choice A) interferes with intestinal digestion and absorption of carbohydrates by inhibiting intestinal brush border glucosidases. This delayed digestion of carbohydrates limits or delays absorption, which reduces hyperglycemia following a meal. This would not be appropriate in a patient with type 1 diabetes, as the underlying concern of the condition is lack of insulin secretion.



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Correct Answer: C.

Adult-onset type 1 diabetes mellitus in the setting of recurrent pancreatitis is a clinically intricate condition marked by pancreatic inflammation precipitating the destruction of β cells and subsequent insulin deficiency. Recurrent pancreatitis, often attributable to factors such as chronic alcohol consumption, gallstones, or autoimmune processes, inflicts damage on the pancreas, impeding its capacity for insulin production. Unlike type 2 diabetes characterized by insulin resistance, type 1 diabetes arises from assault on pancreatic β cells, culminating in absolute insulin deficiency. Treatment mandates a comprehensive approach encompassing insulin therapy to offset β -cell dysfunction, alongside addressing underlying pancreatitis causes to forestall further pancreatic compromise. Vigilant monitoring for complications, notably diabetic ketoacidosis and further pancreatic insufficiency, which is seen in this patient, is essential.

Incorrect Answers: A, B, D, and E.

Acarbose (Choice A) interferes with intestinal digestion and absorption of carbohydrates by inhibiting intestinal brush border glucosidases. This delayed digestion of carbohydrates limits or delays absorption, which reduces hyperglycemia following a meal. This would not be appropriate in a patient with type 1 diabetes, as the underlying concern of the condition is lack of insulin secretion.

Glipizide (Choice B) is a second-generation sulfonylurea. The mechanism of action of sulfonylureas involves closing a potassium channel in a pancreatic islet β -cell membrane, resulting in depolarization of the cell. Depolarization leads to the opening of voltage-gated calcium channels, calcium influx, and endogenous insulin release from the pancreas. This would not be appropriate in a patient with pancreatic insufficiency who is unable to secrete insulin due to damage.

Metformin (Choice D) is an oral biguanide agent used in the management of type 2 diabetes mellitus; it would not be appropriate to treat type 1 diabetes as seen in this case. It decreases gluconeogenesis, increases peripheral tissue glucose uptake, and decreases serum free fatty acid concentration. Metformin may cause several adverse effects, including nausea, abdominal discomfort, diarrhea, and rarely, lactic acidosis.

Repaglinide (Choice E) is an oral antidiabetic in the meglitinide class. Agents in this class act by binding to the SUR1 receptor on pancreatic β cells, stimulating insulin release. In a patient with type 1 diabetes, this would not be appropriate.

Educational Objective: Adult-onset type 1 diabetes in the context of recurrent pancreatitis involves pancreatic inflammation leading to β cell destruction and subsequent insulin deficiency. These patients require insulin supplementation due to this damage.



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✓ 22. A 47-year-old woman is scheduled for discharge home 3 days after total abdominal hysterectomy and bilateral salpingo-oophorectomy for leiomyomata uteri. She has no other history of serious illness. Medications are ibuprofen and oxycodone. She has a family history of osteoporosis, and she is concerned about estrogen therapy because of a strong family history of breast cancer. Vital signs are within normal limits. Examination shows a clean, dry, intact incision site. In addition to exercise and calcium with vitamin D supplementation, which of the following is the most appropriate recommendation for bone health in this patient?

- ☐ A) Transdermal estrogen patch
- ☐ B) Glucosamine-chondroitin therapy
- ☐ C) Thyroid hormone therapy
- ☐ D) Calcitonin nasal spray
- ☒ E) No additional therapy is indicated

Correct Answer: E.

Osteoporosis and osteopenia are metabolic bone diseases characterized by diffuse low bone density. The most common risk factors are age, smoking, chronic inflammatory disease, corticosteroid use, and estrogen-depleting conditions in women. Such demineralization and low bone density is often asymptomatic but increases the risk for fractures, most commonly involving the hip, vertebrae, and distal radius. DEXA scan is used for osteoporosis screening, with bone measurement testing generally recommended for women over the age of 65 years. Calcium and vitamin D supplementation are the first-line options for treatment and prevention of osteoporosis. Weight-bearing exercises are recommended to slow deterioration of bone mineral density. Pharmacologic treatment of osteoporosis may include bisphosphonates, which inhibit osteoclast activity. In this case, the patient has not been diagnosed with osteoporosis or osteopenia. The most appropriate recommendations for bone health currently include regular exercise as well as vitamin D and calcium supplementation; no additional therapy is indicated.

Incorrect Answers: A, B, C, and D.

Transdermal estrogen patch (Choice A) is not the most appropriate recommendation for bone health in this patient. This patient has expressed concern with estrogen



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Correct Answer: E.

Osteoporosis and osteopenia are metabolic bone diseases characterized by diffuse low bone density. The most common risk factors are age, smoking, chronic inflammatory disease, corticosteroid use, and estrogen-depleting conditions in women. Such demineralization and low bone density is often asymptomatic but increases the risk for fractures, most commonly involving the hip, vertebrae, and distal radius. DEXA scan is used for osteoporosis screening, with bone measurement testing generally recommended for women over the age of 65 years. Calcium and vitamin D supplementation are the first-line options for treatment and prevention of osteoporosis. Weight-bearing exercises are recommended to slow deterioration of bone mineral density. Pharmacologic treatment of osteoporosis may include bisphosphonates, which inhibit osteoclast activity. In this case, the patient has not been diagnosed with osteoporosis or osteopenia. The most appropriate recommendations for bone health currently include regular exercise as well as vitamin D and calcium supplementation; no additional therapy is indicated.

Incorrect Answers: A, B, C, and D.

Transdermal estrogen patch (Choice A) is not the most appropriate recommendation for bone health in this patient. This patient has expressed concern with estrogen therapy because of a family history of breast cancer. Exercise as well as vitamin D and calcium supplementation are the most appropriate current recommendations.

Glucosamine-chondroitin therapy (Choice B) is used to relieve joint pain and stiffness in patients with osteoarthritis. It is not the most appropriate recommendation for bone health in this patient, who is not currently experiencing joint pain. Exercise as well as vitamin D and calcium supplementation are the most appropriate recommendations.

Thyroid hormone therapy (Choice C) may be indicated if the patient was identified to have hypothyroidism. No additional therapy is indicated aside from preventative measures of exercise as well as vitamin D and calcium supplementation.

Calcitonin nasal spray (Choice D) may be used to reduce fracture risk in patients diagnosed with osteoporosis. This patient has not been diagnosed with osteoporosis; vitamin D and calcium supplementation in addition to exercise are the most appropriate initial recommendations.

Educational Objective: Osteoporosis is a metabolic bone disease characterized by diffuse low bone density. The most common risk factors are age, smoking, chronic inflammatory disease, corticosteroid use, and estrogen-depleting conditions in women. Supplementation with vitamin D and calcium in addition to regular exercise are first-line preventive measures.

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23. A 15-year-old girl with cystic fibrosis is admitted to the hospital because of a 1-month history of progressive shortness of breath and cough productive of purulent sputum. She has had three hospitalizations for pulmonary exacerbations, the most recent of which was 6 months ago. Her medications are oral montelukast, inhaled fluticasone, inhaled tobramycin, inhaled dornase alfa, and oral azithromycin. She is in moderate respiratory distress. Her temperature is 37.8°C (100°F), pulse is 80/min, and respirations are 30/min. Pulse oximetry on room air shows an oxygen saturation of 85%. Examination shows diffuse crackles bilaterally. Sputum culture results are pending. Which of the following is the most likely causal agent?

- ☐ A) *Bordetella bronchiseptica*
- ☐ B) *Haemophilus influenzae* type b
- ☐ C) Penicillin-resistant *Streptococcus pneumoniae*
- ☒ D) *Pseudomonas aeruginosa*
- ☐ E) *Staphylococcus epidermidis*

Correct Answer: D.

Cystic fibrosis is an autosomal recessive disorder caused by a defect in the *CFTR* gene, leading to a deficiency in a chloride channel that secretes chloride in the lungs and gastrointestinal tract and reabsorbs chloride in sweat glands. This abnormal chloride transport causes decreased chloride and water secretion and increased water reabsorption, leading to abnormally viscous mucus. The thick mucus in the gastrointestinal tract contributes to pancreatic insufficiency, steatorrhea, and malabsorption, leading to a deficiency of fat-soluble vitamins A, D, E, and K. In the lungs, the disease manifests as recurrent pneumonia, especially with *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Repeat antibiotic exposure increases the risk for colonization with resistant organisms. Obstruction and destruction of the airways leads to hypoxemia, air trapping, and bronchiectasis. Physical examination may show hypertrophic osteoarthropathy (clubbing), cyanosis, crackles and rhonchi, and hyperresonance to percussion of the chest. Imaging findings include hyperinflation, bronchiectasis with peribronchial cuffing, and diffuse nonspecific inflammatory changes.

Incorrect Answers: A, B, C, and E.

Bordetella bronchiseptica (Choice A) is a gram-negative bacillus and is a common cause of respiratory disease in dogs and cats. *B. bronchiseptica* rarely causes disease in humans.



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☐ E) *Staphylococcus epidermidis*

Correct Answer: D.

Cystic fibrosis is an autosomal recessive disorder caused by a defect in the *CFTR* gene, leading to a deficiency in a chloride channel that secretes chloride in the lungs and gastrointestinal tract and reabsorbs chloride in sweat glands. This abnormal chloride transport causes decreased chloride and water secretion and increased water reabsorption, leading to abnormally viscous mucus. The thick mucus in the gastrointestinal tract contributes to pancreatic insufficiency, steatorrhea, and malabsorption, leading to a deficiency of fat-soluble vitamins A, D, E, and K. In the lungs, the disease manifests as recurrent pneumonia, especially with *Staphylococcus aureus* and *Pseudomonas aeruginosa*. Repeat antibiotic exposure increases the risk for colonization with resistant organisms. Obstruction and destruction of the airways leads to hypoxemia, air trapping, and bronchiectasis. Physical examination may show hypertrophic osteoarthropathy (clubbing), cyanosis, crackles and rhonchi, and hyperresonance to percussion of the chest. Imaging findings include hyperinflation, bronchiectasis with peribronchial cuffing, and diffuse nonspecific inflammatory changes.

Incorrect Answers: A, B, C, and E.

Bordetella bronchiseptica (Choice A) is a gram-negative bacillus and is a common cause of respiratory disease in dogs and cats. *B. bronchiseptica* rarely causes disease in humans.

Haemophilus influenzae type b (Choice B) is an encapsulated, gram-negative coccobacillus and a common cause of pneumonia in the pediatric and adult populations. However, it is more likely that this patient with cystic fibrosis is suffering from infection with *P. aeruginosa* or *S. aureus*, as these are the most commonly implicated pathogens.

Penicillin-resistant *Streptococcus pneumoniae* (Choice C) is an α -hemolytic, gram-positive coccus that grows in chains. While *Str. pneumoniae* is a common cause of pneumonia in adults, this patient with cystic fibrosis is more likely infected with *P. aeruginosa*.

Staphylococcus epidermidis (Choice E) is a skin flora that is commonly seen in line- or hardware-associated infections, surgical site infections, and endocarditis. It would not be an expected pathogen in pulmonary infections in patients with cystic fibrosis.

Educational Objective: Cystic fibrosis is associated with recurrent pulmonary infections due to the impaired clearance of mucus, microbes, and debris from the airways. The most common pathogens include *Staphylococcus aureus* and *Pseudomonas aeruginosa*.



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- ✓ 24. A 22-year-old man is brought to the emergency department 50 minutes after he was involved in a motor vehicle collision. He was the unrestrained driver and struck his chest on the steering wheel. He did not strike his head or lose consciousness. On arrival, he has soreness in the midsternal area. He does not have shortness of breath. His pulse is 90/min, and blood pressure is 140/80 mm Hg. The lungs are clear to auscultation. Examination shows a large, exquisitely tender, ecchymotic area over the sternum. An ECG shows ST-segment elevation in leads V₁ through V₄. An x-ray of the chest shows no sternal fracture. Echocardiography shows an anterior wall motion hypokinesis. Which of the following is the most appropriate immediate step in management?

- ☒ A) Admission to the cardiac unit
- ☐ B) Intravenous ACE inhibitor therapy
- ☐ C) Intravenous heparin therapy
- ☐ D) Intravenous nitroglycerin therapy
- ☐ E) Thrombolysis

Correct Answer: A.

Admission to the cardiac unit is most appropriate for this patient with new ECG changes and wall motion abnormality after blunt chest trauma. This patient likely has a myocardial contusion. Myocardial contusion may occur as the result of any blunt trauma to the chest but is more common after deceleration injuries. Given the location of the right atrium and ventricle closer to the surface of the chest, the right side of the heart is more frequently injured than the left. While catastrophic injury to the valves, the interventricular septum, or the ventricular free wall can result in rapid decompensation and death, mild myocardial contusion may present with more subtle findings, including new ECG changes. ECG changes are diverse, and patients may develop anything from new bundle branch blocks to cardiac conduction delays, supraventricular tachycardia, or nonspecific ST-segment changes. When any abnormality is identified on ECG or echocardiography, the patient should be admitted to the hospital for serial monitoring to assess for progression to malignant arrhythmia, heart failure, or rupture.

Incorrect Answers: B, C, D, and E.

Intravenous ACE inhibitor therapy (Choice B), intravenous heparin therapy (Choice C), intravenous nitroglycerin therapy (Choice D), and thrombolysis (Choice E) are all appropriate therapies in the management of acute coronary syndromes. While acute coronary syndrome can present with ECG changes including ST-segment elevations



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- ✓ 25. A 32-year-old man comes to the physician because of pain in his right hand 3 days after sustaining a puncture wound to the index finger while gardening. His temperature is 38.9°C (102°F). Examination of the right index finger shows erythema and swelling from the fingertip to the level of the metacarpophalangeal joint. The finger is held in a slightly flexed position. Passive extension of the right index finger increases the pain. There is no drainage from the wound. X-rays of the index finger show soft-tissue swelling. Which of the following is the most likely diagnosis?

- ☒ A) Flexor tenosynovitis
- ☐ B) Midpalmar space infection
- ☐ C) Osteomyelitis
- ☐ D) Paronychia
- ☐ E) Septic arthritis

Correct Answer: A.

The most likely diagnosis in this case is flexor tenosynovitis. Flexor tenosynovitis may present with tenderness along the course of the flexor sheath, symmetric, fusiform enlargement of the digit, a slightly flexed position at rest, volar or circumferential erythema, and pain along the tendon with passive extension. This set of features is known as Kanavel sign; the presence of many or all features is sensitive for the diagnosis. Treatment of infectious tenosynovitis consists of intravenous antibiotic therapy with surgical intervention when indicated. In this case, the patient likely developed infectious flexor tenosynovitis secondary to his puncture wound while gardening.

Incorrect Answers: B, C, D, and E.

Midpalmar space infection (Choice B) may develop deep to the flexor tendons. Surgical intervention is often indicated when these infections occur. However, this patient's presenting symptoms of swelling from the fingertip to the metacarpophalangeal joint, pain with passive extension, and finger in a slightly flexed resting position makes flexor tenosynovitis more likely.

Osteomyelitis (Choice C) is an infection of the bone and the marrow cavity. Results of laboratory studies will show an increase in inflammatory markers such as ESR and C-reactive protein. X-rays may show lytic lesions and cortical destruction.



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- ☐ D) Paronychia
- ☐ E) Septic arthritis

Correct Answer: A.

The most likely diagnosis in this case is flexor tenosynovitis. Flexor tenosynovitis may present with tenderness along the course of the flexor sheath, symmetric, fusiform enlargement of the digit, a slightly flexed position at rest, volar or circumferential erythema, and pain along the tendon with passive extension. This set of features is known as Kanavel sign; the presence of many or all features is sensitive for the diagnosis. Treatment of infectious tenosynovitis consists of intravenous antibiotic therapy with surgical intervention when indicated. In this case, the patient likely developed infectious flexor tenosynovitis secondary to his puncture wound while gardening.

Incorrect Answers: B, C, D, and E.

Midpalmar space infection (Choice B) may develop deep to the flexor tendons. Surgical intervention is often indicated when these infections occur. However, this patient's presenting symptoms of swelling from the fingertip to the metacarpophalangeal joint, pain with passive extension, and finger in a slightly flexed resting position makes flexor tenosynovitis more likely.

Osteomyelitis (Choice C) is an infection of the bone and the marrow cavity. Results of laboratory studies will show an increase in inflammatory markers such as ESR and C-reactive protein. X-rays may show lytic lesions and cortical destruction.

Paronychia (Choice D) often presents with erythema, swelling, and occasionally an abscess along the lateral nail fold. Common pathogens include *Staphylococcus aureus* or *Streptococcus pyogenes*. Repetitive mechanical or chemical injury to the nail fold can predispose to acute paronychia.

Septic arthritis (Choice E) classically presents with a painful, erythematous, swollen joint along with systemic signs and symptoms of illness such as fever, chills, myalgia, arthralgia, and nausea. Septic arthritis results from a bacterial infection of the synovial joint space, most commonly by *S. aureus*.

Educational Objective: The classic presenting symptoms of flexor tenosynovitis include tenderness along the course of the flexor sheath, symmetric, fusiform enlargement of the digit, a slightly flexed position at rest, volar or circumferential erythema, and pain along the tendon with passive extension. Treatment consists of intravenous antibiotic therapy with surgical intervention when indicated.



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26. A 32-year-old woman comes to the physician because of a 1-week history of blood in her urine. She does not have pain or burning with urination. She has no history of serious illness or similar symptoms and takes no medications. Two weeks ago, she fell down a flight of stairs while carrying books. Menses occur at regular 30-day intervals; her last menstrual period was 10 days ago. She is sexually active with one male partner, and they use condoms consistently. Physical examination shows ecchymoses over the right flank with tenderness to palpation. Pelvic examination shows no abnormalities. Which of the following is the most appropriate next step in diagnosis?

- ☐ A) Bladder cystoscopy
- ☐ B) Complete blood count
- ☐ C) Pregnancy test
- ☒ D) Urinalysis
- ☐ E) X-ray of the pelvis

Correct Answer: D.

The evaluation of patient-reported hematuria begins with urinalysis to assess for the presence of red blood cells, hemoglobin, or myoglobin, all of which can cause urine to appear grossly red in color. In this case, urinalysis with microscopic examination will help determine whether this patient's fall resulted in rhabdomyolysis with myoglobinuria or injury to the kidney or ureter given the location of her bruising. Blunt kidney injury can result from moderate-to-high-energy mechanisms, such as falls or motor vehicle collisions. The spectrum of potential injury includes renal contusion, laceration, hematoma, pelvic or calyceal rupture, and partial or complete devascularization. Evaluation for kidney injury also includes imaging, typically CT scan of the abdomen and pelvis with contrast. Small, uncomplicated injuries may be managed conservatively with serial examinations and observation; large, complicated, or devitalizing injuries may require surgical intervention.

Incorrect Answers: A, B, C, and E.

Bladder cystoscopy (Choice A), direct visualization of the bladder mucosa, is useful in the identification of bladder lesions including, but not limited to, tumors. It is appropriate in the evaluation of gross or microscopic hematuria when a bladder source is suspected. This patient has a clear preceding traumatic injury near the right flank, the anatomic location of the kidney and ureter. Cystoscopy would not likely show a source of hematuria in this case.



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Correct Answer: D.

The evaluation of patient-reported hematuria begins with urinalysis to assess for the presence of red blood cells, hemoglobin, or myoglobin, all of which can cause urine to appear grossly red in color. In this case, urinalysis with microscopic examination will help determine whether this patient's fall resulted in rhabdomyolysis with myoglobinuria or injury to the kidney or ureter given the location of her bruising. Blunt kidney injury can result from moderate-to-high-energy mechanisms, such as falls or motor vehicle collisions. The spectrum of potential injury includes renal contusion, laceration, hematoma, pelvic or calyceal rupture, and partial or complete devascularization. Evaluation for kidney injury also includes imaging, typically CT scan of the abdomen and pelvis with contrast. Small, uncomplicated injuries may be managed conservatively with serial examinations and observation; large, complicated, or devitalizing injuries may require surgical intervention.

Incorrect Answers: A, B, C, and E.

Bladder cystoscopy (Choice A), direct visualization of the bladder mucosa, is useful in the identification of bladder lesions including, but not limited to, tumors. It is appropriate in the evaluation of gross or microscopic hematuria when a bladder source is suspected. This patient has a clear preceding traumatic injury near the right flank, the anatomic location of the kidney and ureter. Cystoscopy would not likely show a source of hematuria in this case.

Complete blood count (Choice B) is appropriate if bleeding is suspected to be severe enough to cause anemia or if thrombocytopenia is suspected as a contributor. This patient is otherwise healthy and without signs of anemia nor clinical thrombocytopenia; her bruising is clinically appropriate following trauma.

Pregnancy test (Choice C) is an appropriate test in any female of childbearing age regardless of the presence or absence of sexual activity and date of last menses, though in this case it would not directly assist in refining the differential diagnosis of hematuria and bruising.

X-ray of the pelvis (Choice E) is an appropriate test in the evaluation of potential pelvic or hip fractures; however, this patient's bruising is anatomically distant from the bony pelvis. Imaging is warranted in this case, but CT scan of the abdomen and pelvis would be a more appropriate choice given the location of the injury and differential diagnostic considerations.

Educational Objective: The evaluation of patient-reported hematuria begins with urinalysis to assess for the presence of red blood cells, hemoglobin, or myoglobin, all of which can cause urine to appear grossly red in color. Blunt kidney injury can result from moderate-to-high-energy mechanisms, such as falls or motor vehicle collisions. The spectrum of potential injury includes renal contusion, laceration, hematoma, pelvic or calyceal rupture, and partial or complete devascularization.



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27. A 52-year-old man with major depressive disorder comes to the physician for a follow-up examination. He began fluoxetine therapy 6 weeks ago. Two weeks later, he reported improvement in his mood and said he was feeling hopeful about the future. He has no other history of serious illness and takes no other medications. He does not drink alcohol or use illicit drugs. Physical examination shows no abnormalities. On mental status examination, he has a neutral mood and full range of affect. He says that 1 week ago, he fell out of bed after dreaming about being chased. His wife says he has been intermittently thrashing about while asleep. On one occasion, he punched at her, yelling and cursing. He was surprised and embarrassed when he realized he acted out his dream. He has no history of similar incidents. Which of the following is the most likely explanation for this patient's current nocturnal symptoms?

- ☒ A) REM sleep behavior disorder
- ☐ B) Restless legs syndrome
- ☐ C) Sleep apnea
- ☐ D) Sleep terror disorder
- ☐ E) Sleepwalking disorder

Correct Answer: A.

In typical REM sleep, several neural circuits terminate on spinal cord motor neurons to cause sleep atonia. When this muscle atonia is lost, patients can violently act out their dreams. Patients, like this one, typically remember their dreams. REM sleep behavior disorder most commonly occurs in adult males and can be idiopathic or related to underlying alpha-synuclein deposition (eg, Parkinson disease, multiple system atrophy, or Lewy body dementia). Antidepressants are associated with REM sleep behavior disorder in up to 6% of patients; the mechanism is not fully understood but may be related to underlying alpha-synucleinopathy presenting with depressive symptoms. Polysomnography showing absent atonia during REM sleep confirms the diagnosis. Treatment includes creating a safe sleep environment and, if the behavior is severe, initiating melatonin or clonazepam therapy. Patients with idiopathic REM sleep behavior disorder should be closely monitored because of the high rate of developing a neurodegenerative disease.

Incorrect Answers: B, C, D, and E.

Restless legs syndrome (Choice B) is a common, idiopathic movement disorder characterized by unpleasant sensations in the legs during periods of rest or sleep that are



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☐ E) Sleepwalking disorder

Correct Answer: A.

In typical REM sleep, several neural circuits terminate on spinal cord motor neurons to cause sleep atonia. When this muscle atonia is lost, patients can violently act out their dreams. Patients, like this one, typically remember their dreams. REM sleep behavior disorder most commonly occurs in adult males and can be idiopathic or related to underlying alpha-synuclein deposition (eg, Parkinson disease, multiple system atrophy, or Lewy body dementia). Antidepressants are associated with REM sleep behavior disorder in up to 6% of patients; the mechanism is not fully understood but may be related to underlying alpha-synucleinopathy presenting with depressive symptoms. Polysomnography showing absent atonia during REM sleep confirms the diagnosis. Treatment includes creating a safe sleep environment and, if the behavior is severe, initiating melatonin or clonazepam therapy. Patients with idiopathic REM sleep behavior disorder should be closely monitored because of the high rate of developing a neurodegenerative disease.

Incorrect Answers: B, C, D, and E.

Restless legs syndrome (Choice B) is a common, idiopathic movement disorder characterized by unpleasant sensations in the legs during periods of rest or sleep that are partially alleviated by movement. Dream enactment behavior is uncommon.

Sleep apnea (Choice C) commonly occurs in patients with obesity and symptoms may include daytime somnolence and morning headaches. History of snoring is typical, and diagnosis is made by observing periods of apnea during a sleep study. Dream enactment behavior is uncommon.

Sleep terror disorder (Choice D) is characterized by episodes of sympathetic hyperactivity and vocalizations (eg, screams) during non-REM sleep. Patients are typically unarousable and amnesic to the episode, and the execution of coordinated sequences of movements (other than sleepwalking) is atypical.

Sleepwalking disorder (Choice E) is a common parasomnia of childhood. Sleepwalking behaviors can range from intermittent quiet walking to frequently running around the house or behaving dangerously. It is uncommon in adult patients, and coordinated dream enactment is uncommon.

Educational Objective: REM sleep behavior disorder features absent muscle atonia during REM sleep. Patients typically act out their dreams in a coordinated though sometimes violent manner. REM sleep behavior disorder can be idiopathic or related to underlying alpha-synuclein deposition and is occasionally associated with antidepressant use.



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An x-ray of the abdomen is shown. Which of the following is the most likely diagnosis?

- ☐ A) Cholangiocarcinoma
- ☐ B) Cholecystitis
- ☐ C) *Clostridium difficile* colitis
- ☐ D) Colon cancer
- ☐ E) Gastric lymphoma
- ☐ F) Hepatocellular carcinoma
- ☒ G) Pancreatitis
- ☐ H) Peptic ulcer disease

Correct Answer: G.

The most likely diagnosis in this case is pancreatitis. Chronic pancreatitis is a progressive disease process caused by pancreatic injury from recurrent bouts of acute pancreatitis that results in pancreatic fibrosis, and loss of acinar cells, islet cells, and ducts. In addition to chronic abdominal pain, patients may develop pancreatic insufficiency due to decreased exocrine and endocrine pancreatic secretions. Absence of pancreatic lipase results in steatorrhea and an inability to absorb fat-soluble vitamins, including vitamins A, D, E, and K. Patients may also develop diabetes mellitus due to decreased pancreatic insulin production. Patients with chronic pancreatitis should be treated with pancreatic enzyme repletion and with supplementation of fat-soluble vitamins. Discontinuation of offending agents (eg, alcohol, triggering medications) should also occur. Risk factors include recurrent acute pancreatitis, in this case, likely from long-standing alcohol use. The diagnosis involves clinical features, laboratory studies, and imaging. This patient's x-ray shows multiple areas of calcification in the epigastric area, consistent with calcium deposition from long-standing inflammation.

Incorrect Answers: A, B, C, D, E, F, and H.



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long-standing inflammation.

Incorrect Answers: A, B, C, D, E, F, and H.

Cholangiocarcinoma (Choice A) and hepatocellular carcinoma (Choice F) can present with right upper quadrant abdominal discomfort, nausea, vomiting, weight loss, and signs of biliary obstruction such as hyperbilirubinemia. Laboratory studies may also show increased alkaline phosphatase. This patient does not show signs of hyperbilirubinemia (no jaundice) and has a normal alkaline phosphatase activity.

Cholecystitis (Choice B) presents with right upper quadrant abdominal discomfort, fever, and/or nausea/vomiting, often in a patient with known gallstones. It would not present with subacute to chronic weight loss and pain, and generally would not have calcifications visible in the anatomic region of the pancreas.

Clostridium difficile colitis (Choice C) presents with diffuse, crampy abdominal pain, fever, and watery, sometimes bloody, diarrhea. It generally follows the use of antibiotic medications or exposure within the healthcare system. Calcifications on abdominal x-rays would not be associated with the condition.

Colon cancer (Choice D), if symptomatic, could present with abdominal discomfort, bowel obstruction, weight loss, or gastrointestinal bleeding among other symptoms. Similarly, gastric lymphoma (Choice E) can present with weight loss and early satiety, gastrointestinal bleeding, or gastric outlet obstruction. This patient's use of alcohol and the presence of intra-abdominal calcifications on imaging are more consistent with chronic pancreatitis as an explanatory cause. Symptoms of malignancy are often absent until the condition is advanced.

Peptic ulcer disease (Choice H) presents with epigastric abdominal discomfort associated with meals, nausea, vomiting, and melena. It is associated with infection from *Helicobacter pylori*. Calcification on imaging and association with alcohol use are not features of peptic ulcer disease.

Educational Objective: Chronic pancreatitis can result in pancreatic insufficiency due to chronic, progressive pancreatic inflammation, fibrosis, and loss of acinar cells and islet cells. The decreased secretion of pancreatic digestive enzymes, including lipase, results in steatorrhea and a decreased ability to absorb fat-soluble vitamins. Diagnosis involves clinical features, laboratory studies, and imaging. Treatment is with pancreatic enzyme replacement and discontinuation of any agents causing recurrent pancreatitis.



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- ✓ 29. A previously healthy 67-year-old woman comes to the physician because of a 9-month history of moderate abdominal pain after eating. Eating frequent, small meals has minimized the pain. During this period, she has had an 11-kg (25-lb) weight loss. She has smoked one pack of cigarettes daily for 28 years. She is 160 cm (5 ft 3 in) tall and weighs 45 kg (99 lb); BMI is 18 kg/m². Abdominal examination shows no abnormalities. Examination of the stool for ova and parasites is negative. An x-ray of the abdomen and esophagogastroduodenoscopy show no abnormalities. Which of the following is the most appropriate next step in diagnosis?
- ☐ A) Capsule endoscopy
 - ☐ B) Colonoscopy
 - ☒ C) CT angiography
 - ☐ D) Small-bowel endoscopy
 - ☐ E) Upper gastrointestinal series with small bowel follow-through

Correct Answer: C.

CT angiography is the next most appropriate step in diagnosis. This patient with recent weight loss and postprandial abdominal pain most likely has chronic mesenteric ischemia. Mesenteric ischemia can be acute secondary to thrombosis or stenosis of the mesenteric artery or chronic resulting from low-flow cardiac states leading to intestinal hypoperfusion. The blood supply to the intestines is primarily derived from the superior mesenteric artery and inferior mesenteric artery. Following a meal, the blood flow to the intestines increases to aid in the digestive process. In chronic mesenteric ischemia, constriction of the mesenteric artery in combination with a decreased cardiac output leads to a supply-demand mismatch and subsequent intestinal ischemia. This is often experienced as postprandial pain, which may make some patients avoid eating altogether, thereby leading to weight loss. The diagnosis is made by CT angiography, which shows narrowing or occlusion of the mesenteric vessels and their branches.

Incorrect Answers: A, B, D, and E.

Capsule endoscopy (Choice A) and small-bowel endoscopy (Choice D) are used in the diagnosis of jejunal and proximal ileal pathology located outside of the reachable field of view of upper endoscopy or colonoscopy. These are most commonly used in the workup of small bowel sources of gastrointestinal bleeding or neoplasia.



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- ☒ C) CT angiography
- ☐ D) Small-bowel endoscopy
- ☐ E) Upper gastrointestinal series with small bowel follow-through

Correct Answer: C.

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Incorrect Answers: A, B, D, and E.

Capsule endoscopy (Choice A) and small-bowel endoscopy (Choice D) are used in the diagnosis of jejunal and proximal ileal pathology located outside of the reachable field of view of upper endoscopy or colonoscopy. These are most commonly used in the workup of small bowel sources of gastrointestinal bleeding or neoplasia.

Colonoscopy (Choice B) is useful in the diagnosis and management of colorectal pathology such as malignancy, inflammatory bowel disease, arteriovenous malformation, and strictures. It does not have an immediate role in the diagnosis or management of mesenteric ischemia.

Upper gastrointestinal series with small bowel follow-through (Choice E) is indicated when structural lesions involving the stomach or small bowel are suspected. This is most commonly indicated for the evaluation of small bowel pathology, such as duodenal atresia, malrotation with volvulus, and Crohn disease.

Educational Objective: Mesenteric ischemia can be acute secondary to thrombosis or stenosis of the mesenteric artery or chronic resulting from low-flow cardiac states leading to intestinal hypoperfusion. Low-flow cardiac states in conjunction with mesenteric artery spasm or narrowing lead to a supply-demand mismatch in the postprandial period. This leads to postprandial abdominal pain and gradual weight loss. Diagnosis is made by CT angiography to visualize the mesenteric vessels and their branches.



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✓ 30. A 67-year-old man comes to the physician because of a 3-week history of dull, intermittent, left-sided chest pain that radiates to the left side of his jaw. The pain occurs when he mows his lawn or chops wood. When the pain occurs, he also has light-headedness and nausea. The pain resolves after he rests for several minutes. He has not had fever, night sweats, or changes in weight. He had cold and upper respiratory tract infection symptoms 1 month ago. He has a long-standing history of hypertension and arthritis. His medications are lisinopril, amlodipine, glucosamine, and acetaminophen as needed; acetaminophen and antacid therapy have not improved his pain. He smoked one pack of cigarettes daily for 40 years but quit 10 years ago. His pulse is 52/min, respirations are 20/min, and blood pressure is 158/86 mm Hg. On cardiac examination, an S_3 is heard; a grade 3/6 systolic murmur is heard best at the second right intercostal space. Which of the following is the most appropriate next step in diagnosis?

- ☐ A) Chest x-ray
- ☐ B) CT scan of the chest
- ☒ C) ECG
- ☐ D) Exercise stress test
- ☐ E) Serum lipid studies

Correct Answer: C.

The patient's presentation is consistent with angina pectoris. It is most commonly a result of coronary artery disease and is usually a result of atherosclerotic plaque buildup over many years. Depending on the degree of coronary artery stenosis, the myocardium may not receive sufficient oxygen to meet its metabolic demands during times of increased work. Patients typically develop symptoms on exertion, during heightened emotional states, and after heavy meals. This mismatch in supply and demand of oxygen results in myocardial ischemia and can cause angina. Many individuals with coronary artery disease will have anginal chest pain when they exercise, but symptoms abate with adequate rest or the use of nitroglycerin, which decreases the myocardial oxygen demand and decreases the supply-demand mismatch. Appropriate initial testing includes an ECG and serum troponin assay to assess for the presence of infarction.

Incorrect Answers: A, B, D, and E.

Chest x-ray (Choice A) is an appropriate test in the evaluation of chest pain and shortness of breath to assess for competing causes such as pneumonia and



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☒ C) ECG☐ D) Exercise stress test☐ E) Serum lipid studies

Correct Answer: C.

The patient's presentation is consistent with angina pectoris. It is most commonly a result of coronary artery disease and is usually a result of atherosclerotic plaque buildup over many years. Depending on the degree of coronary artery stenosis, the myocardium may not receive sufficient oxygen to meet its metabolic demands during times of increased work. Patients typically develop symptoms on exertion, during heightened emotional states, and after heavy meals. This mismatch in supply and demand of oxygen results in myocardial ischemia and can cause angina. Many individuals with coronary artery disease will have anginal chest pain when they exercise, but symptoms abate with adequate rest or the use of nitroglycerin, which decreases the myocardial oxygen demand and decreases the supply-demand mismatch. Appropriate initial testing includes an ECG and serum troponin assay to assess for the presence of infarction.

Incorrect Answers: A, B, D, and E.

Chest x-ray (Choice A) is an appropriate test in the evaluation of chest pain and shortness of breath to assess for competing causes such as pneumonia and pneumothorax. However, when a cardiac cause is probable, an ECG is the most appropriate initial test to evaluate for acute ischemia.

CT scan of the chest (Choice B) is appropriate in the evaluation of many structural, infectious, inflammatory, and other causes of chest pain and shortness of breath; however, it is a time-consuming test. When a cardiac cause is probable, an ECG is the most appropriate initial test to evaluate for acute ischemia before conducting further testing.

Exercise stress test (Choice D) is appropriate in the evaluation of exertional chest pain and shortness of breath. Patients with symptoms that are consistent with angina pectoris or with nonspecific symptoms exacerbated by exertion should undergo further evaluation with a stress test once acute ischemia has been ruled out with an ECG.

Serum lipid studies (Choice E) are appropriate in the evaluation of chest pain and shortness of breath to identify and manage atherosclerotic cardiovascular disease. Patients with increased lipid studies who are at increased risk for atherosclerotic cardiovascular disease should be initiated on lipid-lowering therapy. This test should occur after ECG evaluation in any patient reporting chest pain or anginal-equivalent symptoms.



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31. A 17-year-old girl comes to the physician because of irregular menstrual periods since menarche at the age of 11 years. Menses occur at 14- to 90-day intervals and last 1 to 9 days. Her last menstrual period was 2 weeks ago. She has no history of serious illness and takes no medications. She is 163 cm (5 ft 4 in) tall and weighs 91 kg (200 lb); BMI is 34 kg/m². Examination shows dark skin near the base of the neck, under the axillae and breasts, and over the perineum. Central obesity is noted. Measurement of which of the following is the most appropriate next step in management?

- ☐ A) Androstenedione
- ☒ B) Hemoglobin A_{1c}
- ☐ C) Serum estradiol concentration
- ☐ D) Serum follicle-stimulating hormone concentration
- ☐ E) Serum progesterone concentration

Correct Answer: B.

Polycystic ovary syndrome (PCOS) presents with irregular menses, menorrhagia, infertility, acne, and hirsutism, often in patients with an increased body weight. It requires two of the following for diagnosis: oligo-ovulation/anovulation, polycystic ovaries shown on ultrasonography, and clinical or biochemical signs of hyperandrogenism. It is also associated with signs of insulin resistance, such as acanthosis nigricans and increased blood glucose concentrations. PCOS is associated with an abnormal hypothalamic hormonal feedback response, which leads to increased luteinizing hormone in comparison to follicle-stimulating hormone, as well as markedly increased androgen (eg, testosterone) production from the theca lutein cells. Treatment includes weight loss, combined oral contraceptives for menstrual regulation, and spironolactone or ketoconazole for hirsutism. This patient's hemoglobin A_{1c} should be evaluated to assess for underlying diabetes mellitus, which is often associated with PCOS.

Incorrect Answers: A, C, D, and E.

Androstenedione (Choice A) is a steroid produced by the gonads and adrenal glands, playing a key role in the production of estrogen and testosterone. It is used sometimes as an oral supplement to increase testosterone concentrations, mostly to assist athletes in muscle building. Androstenedione concentrations can be increased in PCOS; however, the diagnosis of PCOS can be made without its measurement if signs of hyperandrogenism are present. This patient is showing signs of insulin

Polycystic ovary syndrome (PCOS) presents with irregular menses, menorrhagia, infertility, acne, and hirsutism, often in patients with an increased body weight. It requires two of the following for diagnosis: oligo-ovulation/anovulation, polycystic ovaries shown on ultrasonography, and clinical or biochemical signs of hyperandrogenism. It is also associated with signs of insulin resistance, such as acanthosis nigricans and increased blood glucose concentrations. PCOS is associated with an abnormal hypothalamic hormonal feedback response, which leads to increased luteinizing hormone in comparison to follicle-stimulating hormone, as well as markedly increased androgen (eg, testosterone) production from the theca lutein cells. Treatment includes weight loss, combined oral contraceptives for menstrual regulation, and spironolactone or ketoconazole for hirsutism. This patient's hemoglobin A_{1c} should be evaluated to assess for underlying diabetes mellitus, which is often associated with PCOS.

Incorrect Answers: A, C, D, and E.

Androstenedione (Choice A) is a steroid produced by the gonads and adrenal glands, playing a key role in the production of estrogen and testosterone. It is used sometimes as an oral supplement to increase testosterone concentrations, mostly to assist athletes in muscle building. Androstenedione concentrations can be increased in PCOS; however, the diagnosis of PCOS can be made without its measurement if signs of hyperandrogenism are present. This patient is showing signs of insulin resistance such as acanthosis nigricans and truncal obesity, therefore assessing for diabetes mellitus is the more pertinent next step.

Serum estradiol concentration (Choice C) is unnecessary for the diagnosis of PCOS. It can be used to evaluate for the presence of premature ovarian failure or menopause.

Serum follicle-stimulating hormone concentration (Choice D) may be appropriate in the evaluation of precocious puberty or menopause. Its ratio to luteinizing hormone may be altered in PCOS; however, the absence of such an abnormality would not change the possibility of insulin resistance and diabetes mellitus in an overweight patient with acanthosis nigricans.

Serum progesterone concentration (Choice E) is increased at various times during the menstrual cycle, particularly during the luteal phase as it acts to maintain the secretory endometrium. Measuring serum progesterone concentration may assist in determining whether a woman with abnormal uterine bleeding is ovulating. It does not play a role in the evaluation of PCOS.

Educational Objective: Polycystic ovary syndrome (PCOS) presents with irregular menses, menorrhagia, infertility, acne, and hirsutism, often in patients with an increased body weight. Treatment includes weight loss, combined oral contraceptives for menstrual regulation, and spironolactone or ketoconazole for hirsutism. A patient's hemoglobin A_{1c} should be evaluated to assess for underlying diabetes mellitus, which is often associated with PCOS.



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- ✕ 32. A 14-year-old girl is brought to the physician by her mother because of a 2-month history of moderate breast pain and constant brown to bloody right nipple discharge and tenderness. She first noticed the discharge on her bra at the end of cross-country running season and initially attributed it to bra irritation. She is otherwise asymptomatic. Menarche was at the age of 13 years. Menses occur at regular 28-day intervals. She has no history of serious illness and takes no medications. She has never been sexually active. She is at the 50th percentile for height and 70th percentile for weight. On examination, breast development is sexual maturity rating (SMR) stage 3, and pubic hair development is SMR stage 4. The breasts are small and symmetric. The lateral edges of the right nipple are tender to palpation; a small amount of brown discharge is expressed. Test of the discharge for occult blood is positive. Which of the following is the most likely diagnosis?
- ☐ A) Breast cancer
 - ☒ B) Ductal ectasia
 - ☐ C) Fibroadenoma
 - ☐ D) Mastitis
 - ☐ E) Prolactinoma

Correct Answer: B.

The most likely diagnosis in this case is ductal ectasia. Ductal ectasia is a nonproliferative, benign disease of the breast that occurs predominantly within the central, large ducts. It is characterized by convoluted, elongated ducts with thickened duct walls with associated inflammation and fibrosis in and around the ducts. This ultimately results in breast pain, tenderness, and brown to bloody nipple discharge. There is no known exact cause or associated conditions. It typically presents in patients who are premenopausal in their 40s or 50s; however, it can occur at any age. It is necessary to appropriately rule out alternative diagnoses such as mastitis or an underlying mass in the breast, as symptomatology can overlap. Treatment for mild cases entails reassurance and symptomatic support. A supportive bra, warm compresses, and maintaining nipple and areola hygiene can ameliorate symptoms.

Incorrect Answers: A, C, D, and E.

Breast cancer (Choice A) is the most common nondermatologic malignancy in women. It would be atypical for a patient of 14 years old to develop breast cancer unless



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Correct Answer: B.

The most likely diagnosis in this case is ductal ectasia. Ductal ectasia is a nonproliferative, benign disease of the breast that occurs predominantly within the central, large ducts. It is characterized by convoluted, elongated ducts with thickened duct walls with associated inflammation and fibrosis in and around the ducts. This ultimately results in breast pain, tenderness, and brown to bloody nipple discharge. There is no known exact cause or associated conditions. It typically presents in patients who are premenopausal in their 40s or 50s; however, it can occur at any age. It is necessary to appropriately rule out alternative diagnoses such as mastitis or an underlying mass in the breast, as symptomatology can overlap. Treatment for mild cases entails reassurance and symptomatic support. A supportive bra, warm compresses, and maintaining nipple and areola hygiene can ameliorate symptoms.

Incorrect Answers: A, C, D, and E.

Breast cancer (Choice A) is the most common nondermatologic malignancy in women. It would be atypical for a patient of 14 years old to develop breast cancer unless there was a strong family history of early-onset breast cancer. Additionally, while this patient is presenting with nipple discharge, there is no report of a palpable mass in the breast. In the setting of any nipple discharge, the clinician should perform a thorough breast examination and appropriate diagnostic imaging if indicated to exclude breast cancer.

Fibroadenoma (Choice C) is a benign tumor of the breast composed of stromal and epithelial tissue. It typically presents in younger women in their 20s to 30s. This patient presents with nipple discharge and pain, without a palpable mass.

Mastitis (Choice D) results in acute-onset inflammation of the breast with erythema, pain, and swelling, most commonly in the setting of breast-feeding. This patient presents with subacute symptoms during the past 2 months and does not have erythema of the breast.

Prolactinoma (Choice E) is the most common subtype of functional pituitary adenoma. It can result in galactorrhea as a result of prolactin overstimulation of mammary glandular tissue. This patient is not presenting with milky discharge, making a prolactinoma unlikely.

Educational Objective: Ductal ectasia is a nonproliferative, benign disease of the breast that occurs predominantly within the central, large ducts. It results in breast pain, tenderness, and a brown to bloody nipple discharge. Treatment for mild cases entails reassurance and symptomatic support. A supportive bra, warm compresses, and maintaining nipple and areola hygiene can ameliorate symptoms.



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33. One week after an uncomplicated spontaneous vaginal delivery, a hospitalized 27-year-old woman, gravida 2, para 2, has a temperature of 38.7°C (101.7°F). During the past week, her temperature has ranged from 37.2°C (99°F) to 38.7°C (101.7°F). Pregnancy was uncomplicated. She has been receiving broad-spectrum antibiotic therapy for the past 5 days. Blood and urine cultures were negative on postpartum days 2 and 5. Today, she appears comfortable. Her pulse is 72/min, and blood pressure is 102/64 mm Hg. Pelvic examination shows a small amount of vaginal discharge and no uterine tenderness. Her leukocyte count is 14,000/mm³. Yesterday, her leukocyte count was 18,000/mm³. Which of the following is the most likely diagnosis?

- ☐ A) Antibiotic resistance
- ☐ B) Endometritis
- ☐ C) Pneumonia
- ☒ D) Septic pelvic thrombophlebitis
- ☐ E) Wound infection

Correct Answer: D.

This patient is presenting with postpartum undulating fevers not responsive to broad-spectrum antibiotics, which is suggestive of septic pelvic thrombophlebitis. Septic pelvic thrombophlebitis is an uncommon potential complication following vaginal or cesarean delivery that results from the combination of a hypercoagulable state in the antenatal period along with venous stasis and evolving possible infectious/inflammatory changes in the postpartum period. This combination of factors can result in pelvic venous thrombosis and subsequent superinfection. The risk for development is greater in cesarean compared with vaginal delivery and is often associated with preceding endometritis. It can occur in the setting of pelvic surgery or underlying pelvic malignancy, but this is less common. Patients typically present with a persistent postpartum fever that often undulates over periods of days and is not responsive to broad-spectrum antibiotics. Imaging studies such as ultrasonography and CT scan can be helpful for these patients, mostly to exclude alternative processes such as septic retained products of conception or pelvic abscess formation. Blood cultures may be helpful but are not always positive. Treatment entails therapeutic anticoagulation and broad-spectrum antibiotics, particularly clindamycin and gentamicin.

Incorrect Answers: A, B, C, and E.

Antibiotic resistance (Choice A) would not appropriately explain this patient's presentation, as this patient is presenting with undulating fevers suggestive of septic pelvic



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Correct Answer: D.

This patient is presenting with postpartum undulating fevers not responsive to broad-spectrum antibiotics, which is suggestive of septic pelvic thrombophlebitis. Septic pelvic thrombophlebitis is an uncommon potential complication following vaginal or cesarean delivery that results from the combination of a hypercoagulable state in the antenatal period along with venous stasis and evolving possible infectious/inflammatory changes in the postpartum period. This combination of factors can result in pelvic venous thrombosis and subsequent superinfection. The risk for development is greater in cesarean compared with vaginal delivery and is often associated with preceding endometritis. It can occur in the setting of pelvic surgery or underlying pelvic malignancy, but this is less common. Patients typically present with a persistent postpartum fever that often undulates over periods of days and is not responsive to broad-spectrum antibiotics. Imaging studies such as ultrasonography and CT scan can be helpful for these patients, mostly to exclude alternative processes such as septic retained products of conception or pelvic abscess formation. Blood cultures may be helpful but are not always positive. Treatment entails therapeutic anticoagulation and broad-spectrum antibiotics, particularly clindamycin and gentamicin.

Incorrect Answers: A, B, C, and E.

Antibiotic resistance (Choice A) would not appropriately explain this patient's presentation, as this patient is presenting with undulating fevers suggestive of septic pelvic thrombophlebitis. This patient does not have significant vaginal discharge and is overall appearing comfortable. If this patient was presenting with resistant endometritis, she would likely clinically be deteriorating with worsening symptomatology.

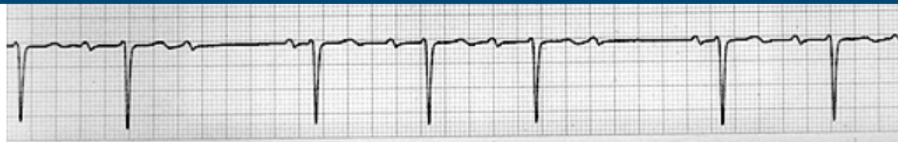
Endometritis (Choice B) presents with fever and uterine tenderness following delivery. It is often related to acute, typically polymicrobial infection of the uterine endometrium. This patient is presenting with only a small amount of vaginal discharge and no uterine tenderness on examination.

Pneumonia (Choice C) is unlikely as this patient is presenting with no respiratory symptoms, and has an undulating fever, which would be atypical for pneumonia. Additionally, this patient has no particular risk factors for the development of pneumonia other than recent delivery in the hospital.

Wound infection (Choice E) is inconsistent with this patient's presentation as she underwent vaginal, not cesarean, delivery.

Educational Objective: Septic pelvic thrombophlebitis is an uncommon potential complication following vaginal or cesarean delivery that results from the combination of a hypercoagulable state in the antenatal period along with venous stasis and evolving possible infectious/inflammatory changes in the postpartum period. This combination of factors can result in pelvic venous thrombosis and subsequent superinfection. Patients typically present with a persistent postpartum fever that often undulates over periods of days and is not responsive to broad-spectrum antibiotics.

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34. A 42-year-old man comes to the physician for a health maintenance examination. He runs 30 miles weekly and recently completed his third marathon. He works as an airline pilot. He has no history of serious illness and takes no medications. His father had a myocardial infarction at the age of 54 years. The patient's pulse is 56/min, respirations are 12/min, and blood pressure is 110/60 mm Hg. Examination shows no abnormalities. An ECG is shown. Which of the following is the most appropriate next step in management?
- ☐ A) Administration of atropine
 - ☐ B) Administration of epinephrine
 - ☐ C) Atrioventricular node ablation
 - ☐ D) Placement of an implantable cardioverter defibrillator
 - ☐ E) Placement of a pacemaker
 - ☒ F) Observation only

Correct Answer: F.

Observation only is appropriate at this time. This patient's ECG shows second-degree atrioventricular (AV) block, type I. Second-degree AV block has two presentations: type I and type II. Second-degree AV block type I shows a prolonged PR interval that progressively increases followed by a nonconducted P wave (no QRS), with resumption of normal conduction. It is usually benign and rhythms appear as shown in the ECG. In this case, every fourth P wave is not followed by a QRS complex. In contrast, second-degree AV block type II is identified by a prolonged PR interval that does not progressively increase with intermittent nonconducted P waves. Treatment usually involves placement of a pacemaker for type II, whereas type I is generally benign and suitable for observation.

☐ E) Placement of a pacemaker

☒ F) Observation only

Correct Answer: F.

Observation only is appropriate at this time. This patient's ECG shows second-degree atrioventricular (AV) block, type I. Second-degree AV block has two presentations: type I and type II. Second-degree AV block type I shows a prolonged PR interval that progressively increases followed by a nonconducted P wave (no QRS), with resumption of normal conduction. It is usually benign and rhythms appear as shown in the ECG. In this case, every fourth P wave is not followed by a QRS complex. In contrast, second-degree AV block type II is identified by a prolonged PR interval that does not progressively increase with intermittent nonconducted P waves. Treatment usually involves placement of a pacemaker for type II, whereas type I is generally benign and suitable for observation.

Incorrect Answers: A, B, C, D, and E.

Administration of atropine (Choice A) is appropriate in cases of bradycardia that are symptomatic and/or accompanied by hemodynamic instability. It is a short-acting medication that is not appropriate for long-term management of bradycardia, or incidentally noted, asymptomatic bradycardia. Similarly, administration of epinephrine (Choice B) is used in the management of bradyarrhythmia associated with pulseless electrical activity during simultaneous cardiopulmonary resuscitation with chest compressions. It is not appropriate in cases of asymptomatic bradycardia.

Atrioventricular node ablation (Choice C) is used in the management of some supraventricular and atrioventricular nodal tachycardias. Nodal ablation would worsen conduction through the node itself and worsen this patient's atrioventricular block. This treatment is inappropriate in the management of AV nodal block.

Placement of an implantable cardioverter defibrillator (Choice D) is used in the management of dysrhythmias including ventricular tachycardia and fibrillation among other indications; such rhythms are not shown on this ECG.

Placement of a pacemaker (Choice E) is appropriate in the management of symptomatic bradycardia including second-degree AV block type II, and third-degree AV block, among others; such rhythms are not shown on this ECG.

Educational Objective: Second-degree AV block type I shows a prolonged PR interval on ECG that progressively increases followed by a nonconducted P wave (no QRS), with resumption of normal conduction. It is usually benign, and there is no indication for specific therapies in asymptomatic, hemodynamically stable patients.



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35. A 52-year-old man comes to the office for a follow-up examination 4 months after undergoing allogeneic stem cell transplant for acute myelogenous leukemia. He has had five to six loose, watery stools during the past 3 days. He has a 3-week history of an itchy rash over his face, chest, upper back, and arms. He reports that he has continued to have fatigue and mild dryness of the eyes and mouth since his last visit 1 month ago. He has not had fever, night sweats, or cough. The patient and the donor tested positive for cytomegalovirus before the transplant. The patient has no other history of serious illness. His medications are tacrolimus, prednisone, mycophenolate, trimethoprim-sulfamethoxazole, and acyclovir; he has had no adverse effects. Vital signs are within normal limits. Examination shows a faint macular rash without scaling across the face, chest, upper back, and upper extremities. There is no lymphadenopathy. The eyes are mildly dry, and the sclerae are erythematous. Cardiopulmonary examination shows no abnormalities. Serum studies show:

Total bilirubin	2.1 mg/dL
Alkaline phosphatase	145 U/L
AST	112 U/L
ALT	175 U/L

Results of a complete blood count, measurement of serum electrolyte concentrations, and renal function tests are within the reference ranges. Which of the following is the most likely diagnosis?

- ☐ A) Acute hepatitis A
- ☐ B) Disseminated cryptococcal infection
- ☐ C) Disseminated varicella infection
- ☒ D) Graft-versus-host disease
- ☐ E) Pityriasis rosea

Correct Answer: D.

Graft-versus-host disease (GVHD) is the most likely cause of this patient's diarrhea, rash, and increased liver enzymes. Prior to the grafting of allogeneic stem cells in a bone marrow transplant, recipient native marrow must be ablated. It is replaced with donor marrow, which recolonizes the marrow cavity. Successful transplant results in



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☒ D) Graft-versus-host disease☐ E) Pityriasis rosea

Correct Answer: D.

Graft-versus-host disease (GVHD) is the most likely cause of this patient's diarrhea, rash, and increased liver enzymes. Prior to the grafting of allogeneic stem cells in a bone marrow transplant, recipient native marrow must be ablated. It is replaced with donor marrow, which recolonizes the marrow cavity. Successful transplant results in reconstitution of the immune system with the donor's immune cells. GVHD occurs when the donor's immune system recognizes the host's tissues as foreign and mounts an immune response against them. Manifestations of acute GVHD include rash, ranging from maculopapular to blistering, diarrhea and abdominal pain, as well as hepatitis with hyperbilirubinemia. Diagnosis should be suspected in patients with any of these symptoms in the setting of a recent bone marrow transplant. Medications used in the treatment of GVHD act either by directly inhibiting production of T lymphocytes or by suppressing the normal function of these cells. Examples include mycophenolate mofetil, etanercept, and sirolimus.

Incorrect Answers: A, B, C, and E.

Acute hepatitis A (Choice A) is not the most likely cause of this patient's symptoms. Acute hepatitis A typically presents with aminotransferases greater than 1000 U/L. With a history of stem cell transplant, GVHD is more likely.

Disseminated cryptococcal infection (Choice B) is not consistent with this patient's presentation. Symptoms of disseminated cryptococcal infection may include meningitis, encephalitis, and pulmonary cryptococcosis.

Disseminated varicella infection (Choice C) may present with recurrent vesicles over the course of weeks, pneumonia, abdominal pain, and disseminated intravascular coagulation. The most likely diagnosis in this case is GVHD, as the patient has a history of stem cell transplant.

Pityriasis rosea (Choice E) is characterized by the acute onset of a pruritic patch followed by the development of numerous smaller macules and patches in the setting of a recent viral illness. The individual patches of pityriasis rosea are oval in shape, scaly, and have a rim of scale around the leading edge. The symptoms in this case are not consistent with pityriasis rosea.

Educational Objective: Graft-versus-host disease (GVHD) typically occurs following bone marrow transplant and manifests with diarrhea, rash, and increased liver



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✓ 36. An 11-year-old boy is brought to the office by his parents because of a 2-day history of dark urine. Five days ago, he had a mild upper respiratory tract infection, which resolved spontaneously. He has not had pain with urination. He has not had sick contacts. He had frequent episodes of otitis media during infancy. He failed a hearing test at school 6 months ago, and his parents plan to schedule audiometry. He has no other history of serious illness and receives no medications. Immunizations are up-to-date. Growth and development are appropriate for age. The patient's maternal uncle has end-stage renal disease. The patient's temperature is 37°C (98.6°F), pulse is 80/min, respirations are 12/min, and blood pressure is 100/70 mm Hg. Examination shows no abnormalities. Urinalysis shows:

RBC	50/hpf
WBC	1–5/hpf
Protein	3+

Which of the following is the most likely diagnosis?

- ☒ A) Alport syndrome
- ☐ B) IgA vasculitis (formerly Henoch-Schönlein purpura)
- ☐ C) Poststreptococcal glomerulonephritis
- ☐ D) Sickle cell disease
- ☐ E) Systemic lupus erythematosus

Correct Answer: A.

Alport syndrome is a rare disease associated with progressive renal failure, sensorineural hearing loss, and ocular abnormalities. It arises from genetic mutations (most commonly X-linked, but also autosomal dominant or recessive) that cause dysfunctional type IV collagen resulting in defective glomerular basement membrane synthesis. Primary features include chronic and progressive kidney disease, usually nephritis/nephritic syndrome, which causes hematuria and proteinuria. This may eventually result in end-stage renal disease requiring dialysis. Hearing loss is a common finding and is usually incomplete but may be progressive as the disease advances. The diagnosis should be suspected in persons, like this patient, with a family history of both end-stage renal disease and hearing loss, especially if present in an X-linked pattern. The



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Alport syndrome is a rare disease associated with progressive renal failure, sensorineural hearing loss, and ocular abnormalities. It arises from genetic mutations (most commonly X-linked, but also autosomal dominant or recessive) that cause dysfunctional type IV collagen resulting in defective glomerular basement membrane synthesis. Primary features include chronic and progressive kidney disease, usually nephritis/nephritic syndrome, which causes hematuria and proteinuria. This may eventually result in end-stage renal disease requiring dialysis. Hearing loss is a common finding and is usually incomplete but may be progressive as the disease advances. The diagnosis should be suspected in persons, like this patient, with a family history of both end-stage renal disease and hearing loss, especially if present in an X-linked pattern. The diagnosis is confirmed by renal biopsy and genetic testing. Treatment includes ACE inhibitor therapy along with measures to slow the progression of kidney disease, though many patients eventually require dialysis or kidney transplant.

Incorrect Answers: B, C, D, and E.

IgA vasculitis (formerly Henoch-Schönlein purpura) (Choice B) is an acute, systemic, small-vessel vasculitis that occurs in children and typically presents with gravity-dependent purpura (eg, buttocks, legs, feet), arthralgias, hematuria, and abdominal pain. It often occurs following a viral illness or upper respiratory tract infection. It is generally self-limited and does not present with hearing loss.

Poststreptococcal glomerulonephritis (Choice C) can cause acute kidney injury following an infection with *Streptococcus pyogenes* (group A), typically impetigo, pharyngitis, or tonsillitis. Patients present with dark-colored urine, hypertension, and peripheral and periorbital edema, with urinalysis showing red blood cell casts. Hearing loss is not a common feature.

Sickle cell disease (Choice D) results from genetic mutations that affect the synthesis of hemoglobin. Common clinical features include dactylitis, functional asplenia, frequent pain crises, avascular necrosis, and isosthenuria. When renal disease is progressive in this setting, it is often due to the development of nephrotic syndrome, marked by proteinuria and progressive renal sclerosis. Hearing loss is not a common feature.

Systemic lupus erythematosus (Choice E) is an autoimmune disorder that affects multiple organ systems with a wide variety of symptoms. The skin and mucous membranes, nervous system, musculoskeletal system, and renal system may all be affected. Renal involvement is often characterized by nephritic syndrome. Hearing loss is not a common feature.

Educational Objective: Alport syndrome is a rare disease associated with progressive renal failure, sensorineural hearing loss, and ocular abnormalities. The diagnosis should be suspected in cases of hearing loss and kidney disease occurring within members of the same family. Treatment includes ACE inhibitor therapy along with measures to slow the progression of kidney disease, though many patients eventually require dialysis or kidney transplant.



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37. A 17-year-old girl comes to the office for a health maintenance examination for school. She has no history of serious illness or surgical procedures. Her mother has type 2 diabetes mellitus and hypercholesterolemia, and her father died of a heart attack at the age of 54 years. Menses occur at regular 28-day intervals. Her last menstrual period was 2 weeks ago. She does not smoke cigarettes and has never been sexually active. Her diet consists of mainly carbohydrates and fats with minimal protein or vegetables. She drinks two glasses of whole cow milk daily. She is 157 cm (5 ft 2 in) tall and weighs 68 kg (150 lb); BMI is 27 kg/m². Her pulse is 84/min, and blood pressure is 110/60 mm Hg. Examination shows no other abnormalities. Which of the following is the most appropriate next step in management?

- ☐ A) ECG
- ☒ B) Determination of hemoglobin A_{1c}
- ☐ C) Measurement of serum thyroid-stimulating hormone concentration
- ☐ D) Oral glucose tolerance test
- ☐ E) Pap smear
- ☐ F) Serum lipid studies

Correct Answer: F.

Serum lipid studies should be assessed in this 17-year-old patient with an increased BMI. The American Academy of Pediatrics (AAP) recommends screening asymptomatic children and adolescents at risk for atherosclerotic cardiovascular disease for dyslipidemia, especially those at risk due to family history of dyslipidemia or secondary factors such as obesity or diabetes mellitus. This patient, with signs of adolescent obesity and family history in both parents, should be screened for dyslipidemia to address her risk for early atherosclerotic disease. Notably, the recommendations from the AAP and the United States Preventive Services Task Force (USPSTF) differ. As of 2024, the USPSTF reports there is insufficient evidence on which to base screening recommendations for asymptomatic patients aged 20 years or younger. However, they note that clinicians should use their judgement when deciding whether screening is appropriate for individual patients.

Incorrect Answers: A, B, C, D, and E.

ECG (Choice A) is incorrect. As of 2023, there is no conclusive recommendation from the AAP or USPSTF on universal screening with ECG in children or adolescents outside of those who have pre-existing cardiac disease or who are at high risk for sudden cardiac death. ECG is an appropriate test in evaluating athletes at risk for sudden



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☐ F) Serum lipid studies

Correct Answer: F.

Serum lipid studies should be assessed in this 17-year-old patient with an increased BMI. The American Academy of Pediatrics (AAP) recommends screening asymptomatic children and adolescents at risk for atherosclerotic cardiovascular disease for dyslipidemia, especially those at risk due to family history of dyslipidemia or secondary factors such as obesity or diabetes mellitus. This patient, with signs of adolescent obesity and family history in both parents, should be screened for dyslipidemia to address her risk for early atherosclerotic disease. Notably, the recommendations from the AAP and the United States Preventive Services Task Force (USPSTF) differ. As of 2024, the USPSTF reports there is insufficient evidence on which to base screening recommendations for asymptomatic patients aged 20 years or younger. However, they note that clinicians should use their judgement when deciding whether screening is appropriate for individual patients.

Incorrect Answers: A, B, C, D, and E.

ECG (Choice A) is incorrect. As of 2023, there is no conclusive recommendation from the AAP or USPSTF on universal screening with ECG in children or adolescents outside of those who have pre-existing cardiac disease or who are at high risk for sudden cardiac death. ECG is an appropriate test in evaluating athletes at risk for sudden cardiac death, or in cases of congenital heart disease or channelopathies.

Determination of hemoglobin A_{1c} (Choice B) and oral glucose tolerance test (Choice D) are incorrect. As of 2023, there is no conclusive recommendation from the AAP or USPSTF on universal screening for diabetes mellitus in children or adolescents. Such testing would be appropriate in children or adolescents with symptoms of diabetes mellitus, or in whom there is high suspicion or risk given other comorbidities.

Measurement of serum thyroid-stimulating hormone concentration (Choice C) is incorrect. As of 2023, there is no conclusive recommendation from the AAP or USPSTF on routine screening for thyroid dysfunction in children and adolescents. This test is appropriate in cases where there is clinical evidence for thyroid dysfunction.

Pap smear (Choice E) is not routinely recommended in children and adolescents, especially those who have never been sexually active. This test is recommended beginning at age 21 years.

Educational Objective: Assessment of lipids is recommended by the American Academy of Pediatrics for children and adolescents with overweight or obesity as well as those with a family history of dyslipidemia. Early detection of dyslipidemia permits early treatment of the condition and prevention of future atherosclerotic cardiovascular disease.



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38. A hospitalized 82-year-old man has a 3-day history of progressive irritability after undergoing uncomplicated aortic valve replacement. He also has had insomnia during this time. He says he feels **restless and edgy** after sundown, and he repeatedly asks to go home “so **I can at** least sleep.” He has chronic kidney disease, asthma, and central sleep apnea. His hospital medications are albuterol, cefepime, oxycodone, and sevelamer. He drinks one 12-oz beer once weekly and has smoked two packs of **cigarettes daily for 58 years**. He appears fatigued but alert and attentive. Vital signs are within normal limits. Physical examination shows a clean, dry sternal incision and a barrel-shaped chest. On mental status examination, he has a surly **mood and** restricted affect. Cognition is intact. Which of the following is the most appropriate next step in management of this patient’s insomnia?

- ☐ A) Begin clonazepam therapy at bedtime
- ☐ B) Begin diphenhydramine therapy at bedtime
- ☒ C) Begin nicotine transdermal therapy
- ☐ D) Discontinue albuterol therapy
- ☐ E) Increase the dose of oxycodone throughout the day

Correct Answer: C.

This patient with a heavy smoking history and days of increased irritability, restlessness, and insomnia after hospital admission is likely experiencing nicotine withdrawal. The most appropriate next step in management of his insomnia is to begin nicotine transdermal therapy. Patients are not typically allowed to smoke while admitted, and not all medical teams are proactive about ordering nicotine replacement. Nicotine withdrawal typically presents with dysphoric or irritable mood, anxiety or restlessness, insomnia, difficulty concentrating, and increased appetite. Withdrawal symptoms typically subside within a few weeks. However, cravings may persist for months or years. Smoking cessation medications, particularly nicotine replacement therapy, and behavioral interventions (eg, counseling about symptoms) can help withdrawal symptoms. All patients should be screened for smoking on admission and given nicotine replacement prophylactically.

Incorrect Answers: A, B, D, and E.

Begin clonazepam therapy at bedtime (Choice A) is less likely to help this patient's nicotine withdrawal symptoms than nicotine replacement. Additionally, benzodiazepines are associated with increased confusion in older patients and respiratory depression, and are therefore relatively contraindicated in smoking-related lung diseases.



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- ☒ C) Begin nicotine transdermal therapy
- ☐ D) Discontinue albuterol therapy
- ☐ E) Increase the dose of oxycodone throughout the day

Correct Answer: C.

This patient with a heavy smoking history and days of increased irritability, restlessness, and insomnia after hospital admission is likely experiencing nicotine withdrawal. The most appropriate next step in management of his insomnia is to begin nicotine transdermal therapy. Patients are not typically allowed to smoke while admitted, and not all medical teams are proactive about ordering nicotine replacement. Nicotine withdrawal typically presents with dysphoric or irritable mood, anxiety or restlessness, insomnia, difficulty concentrating, and increased appetite. Withdrawal symptoms typically subside within a few weeks. However, cravings may persist for months or years. Smoking cessation medications, particularly nicotine replacement therapy, and behavioral interventions (eg, counseling about symptoms) can help withdrawal symptoms. All patients should be screened for smoking on admission and given nicotine replacement prophylactically.

Incorrect Answers: A, B, D, and E.

Begin clonazepam therapy at bedtime (Choice A) is less likely to help this patient's nicotine withdrawal symptoms than nicotine replacement. Additionally, benzodiazepines are associated with increased confusion in older patients and respiratory depression, and are therefore relatively contraindicated in smoking-related lung diseases.

Begin diphenhydramine therapy at bedtime (Choice B) is less likely to help this patient's nicotine withdrawal symptoms than nicotine replacement. Additionally, diphenhydramine is associated with increased confusion in older patients.

Discontinue albuterol therapy (Choice D) is not indicated. Though albuterol use is associated with anxiety, this patient's anxiety (ie, "restless and edgy") is acute and associated with the onset of hospitalization, making withdrawal from nicotine the more likely explanation.

Increase the dose of oxycodone throughout the day (Choice E) is not indicated. Though opioid medication can help with pain and anxiety associated with dyspnea at the end of life, this patient is not reporting dyspnea and he is not at the end of his life.

Educational Objective: Nicotine withdrawal typically presents with dysphoric or irritable mood, anxiety or restlessness, insomnia, difficulty concentrating, and increased appetite. First-line treatment is nicotine replacement.



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- ✓ 39. A 62-year-old woman comes to the office because of a 3-month history of progressive fatigue that has not been associated with any illness or other precipitating factors. She has gained 4 kg (8 lb) during the past 2 months despite attempting to follow a weight loss diet; she also has had constipation during this time. She has hypertension treated with lisinopril. She drinks one alcoholic beverage weekly and does not smoke cigarettes. She is not in distress. She is 165 cm (5 ft 5 in) tall and weighs 73 kg (160 lb); BMI is 27 kg/m². Vital signs are temperature 37.0°C (98.6°F), pulse 70/min, respirations 12/min, and blood pressure 130/72 mm Hg. Neck is supple with no thyromegaly or adenopathy. Cardiopulmonary examination discloses no abnormalities. Examination of the lower extremities shows no edema; reflexes are 1+ at the knees with delayed relaxation. Which of the following is the most likely complication of this patient's condition?
- ☒ A) Hypercholesterolemia
 - ☐ B) Hyperkalemia
 - ☐ C) Hypernatremia
 - ☐ D) Hypocalcemia
 - ☐ E) Hypochloremia
 - ☐ F) Hypokalemia

Correct Answer: A.

Hypothyroidism classically presents with a combination of fatigue, weight gain, constipation, cold intolerance, and heavy or irregular menstrual periods. Physical examination may show bradycardia, dry, edematous skin, and delayed relaxation of deep tendon reflexes. In this patient, her symptoms of tiredness, weight gain, and constipation in the absence of any other illnesses and despite attempts to lose weight suggest an underlying thyroid issue. While many causes of hypothyroidism exist, chronic lymphocytic (Hashimoto) thyroiditis is a common cause of painless thyroiditis, which may present with a palpable, enlarged thyroid gland, though not necessary for diagnosis. With progressive inflammation and destruction of the thyroid parenchyma, circulating concentrations of thyroxine and triiodothyronine decrease. This leads to feedback on the hypothalamus and anterior pituitary which leads to increased concentrations of thyrotropin-releasing hormone, TSH, and prolactin. The increased TSH is measurable in serum and provides ongoing trophic stimulation to the thyroid gland. Increased prolactin may cause breast development and/or galactorrhea and may promote irregular anovulatory cycles or amenorrhea through feedback on gonadotropin-releasing hormone. Due to metabolic slowing caused by the low circulating concentrations of thyroid hormones, these patients are susceptible to weight gain, as seen in this patient, as well as other nutritional derangements including hypercholesterolemia. Treatment includes supplementation with levothyroxine and frequent follow-up visits to evaluate for therapeutic effectiveness, including monitoring of

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40. A 48-year-old man comes to the emergency department 6 hours after the sudden onset of severe right-sided chest pain that increases with inspiration. He also has had shortness of breath during this time. Ten days ago, he sustained a nondisplaced right ankle fracture while playing basketball. He was taken to the emergency department, and a cast was placed on his right lower extremity. He has hypertension treated with amlodipine and has been taking ibuprofen for ankle pain. His temperature is 37.2°C (98.9°F), pulse is 110/min and regular, respirations are 32/min, and blood pressure is 90/50 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90%. Cardiac examination shows no other abnormalities. There is splinting of the right hemithorax. The remainder of the examination shows no abnormalities. Which of the following sets of cardiac output and systemic vascular resistance findings is most likely to be found in this patient?

- | | Cardiac Output | Systemic Vascular Resistance |
|-------------------------------------|----------------|------------------------------|
| <input type="radio"/> A) | Decreased | decreased |
| <input checked="" type="radio"/> B) | Decreased | increased |
| <input type="radio"/> C) | Increased | decreased |
| <input type="radio"/> D) | Increased | increased |
| <input type="radio"/> E) | Normal | normal |

Correct Answer: B.

Pulmonary thromboembolism is a common disorder caused by occlusion of a pulmonary artery and impaired blood flow to a segment of lung. Pulmonary embolism classically presents with acute chest pain, shortness of breath, and hypoxemia. Some patients may also present after an episode of syncope. Presenting features are variable based on the size, location, and duration of embolism. Vital signs are sometimes notable for tachycardia, tachypnea, and hypoxia. Pulmonary emboli are often undetectable on chest x-ray; even large emboli are generally x-ray occult and require CT angiography for diagnosis. ECG may be normal, may disclose sinus tachycardia, or may show nonspecific changes including ST segment and T wave changes, right bundle branch block, right axis deviation, or signs of right ventricular strain. Due to outflow obstruction, cardiac output is decreased, with a reflexive increase in systemic vascular resistance to maintain adequate mean arterial pressures. Risk factors include immobility, obesity, recent surgery, malignancy, pregnancy, use of oral contraceptives, trauma, fracture of long bones, and inherited thrombophilia.



41. A 4-year-old girl is brought to the office by her 26-year-old mother for a well-child examination. The mother says that her daughter is full of energy and is always asking her parents to play with or read to her. She becomes irritable and sulks when her mother refuses. The mother says she is exhausted from taking care of the patient and a 2-year-old son. She says the family has had a difficult year; their home was repossessed by the bank, and they are now living with the father's parents. The mother becomes tearful as she describes their ongoing financial problems and how much they miss their old home. The mother's sister and father have major depressive disorder. Physical examination of the patient shows no abnormalities. The mother asks what she can do to best help herself and her family. Which of the following is the most appropriate recommendation?

- ☐ A) Couples therapy
- ☒ B) Financial advisor services for the parents
- ☐ C) Play therapy for the children
- ☐ D) Psychiatric evaluation for the mother

Correct Answer: D.

Symptoms of major depressive disorder (MDD) include 2 or more weeks of at least five of the following symptoms: depressed mood, anhedonia, guilt or feelings of worthlessness, difficulty concentrating, psychomotor slowing, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). These symptoms disrupt everyday functioning. In patients who are genetically vulnerable to MDD, stressors may induce the disorder. This patient's mother is experiencing major stressors and demonstrates some possible depressive symptoms including a tearful mood and decreased energy. The pediatrician is not the physician of the mother so cannot further screen for MDD. As such, this physician should recommend that this woman be evaluated for MDD by her own physician. Treatment of MDD commonly includes psychotherapy and/or antidepressant medication.

Incorrect Answers: A, B, and C.

Couples therapy (Choice A) is a type of psychotherapy that typically explores and attempts to resolve conflicts within a romantic couple. This woman does not disclose a conflict with her partner.

Financial advisor services for the parents (Choice B) may be beneficial. However, such a recommendation is outside of the physician's scope.



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- ☐ A) Couples therapy
- ☐ B) Financial advisor services for the parents
- ☐ C) Play therapy for the children
- ☒ D) Psychiatric evaluation for the mother

Correct Answer: D.

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Incorrect Answers: A, B, and C.

Couples therapy (Choice A) is a type of psychotherapy that typically explores and attempts to resolve conflicts within a romantic couple. This woman does not disclose a conflict with her partner.

Financial advisor services for the parents (Choice B) may be beneficial. However, such a recommendation is outside of the physician's scope.

Play therapy for the children (Choice C) can help them with anxiety, adjustment disorder, and attention-deficit/hyperactivity disorder. However, this woman's children demonstrate age-appropriate behavior (a degree of attention seeking behavior can be normal).

Educational Objective: Patients presenting with depressive symptoms in the setting of stressors should be evaluated for major depressive disorder (MDD). MDD involves depressed mood, anhedonia, guilt or feelings of worthlessness, difficulty concentrating, psychomotor slowing, suicidal thoughts, and/or neurovegetative symptoms (decreased energy, sleep disturbance, appetite disturbance). A parent experiencing stressors and demonstrating possible depressive symptoms during a pediatric visit should be evaluated for MDD by their own physician.



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- ✓ 42. A 19-year-old man who is a US Army recruit is brought to the emergency department by his commanding officer 30 minutes after he was found in a supply shed. The patient covered the windows in aluminum foil to "keep enemy radio signals from penetrating the command center." The commanding officer searched for the recruit after he did not arrive for morning formation. The patient is insisting that he is "battalion commander." Physical examination and laboratory studies show no other abnormalities. Toxicology screening results are negative. The patient's parents are contacted, and they state that he **has no history of psychiatric illness.** Recruits bunking next to him in the barracks are interviewed and state that his behavior has become progressively odd during the past month. Which of the following is the most likely diagnosis?
- ☐ A) Delusional disorder
 - ☐ B) Paranoid personality disorder
 - ☐ C) Schizoaffective disorder
 - ☐ D) Schizophrenia
 - ☒ E) Schizophreniform disorder

Correct Answer: E.

According to the DSM-5, patients with schizophreniform disorder must demonstrate two of the following: delusions, hallucinations, disorganized speech, or disorganized behavior (known as positive symptoms), or flat affect, apathy, or alogia (known as negative symptoms). To meet diagnostic criteria, patients must demonstrate symptoms for longer than 1 month and less than 6 months. Two-thirds of patients with schizophreniform disorder ultimately develop schizophrenia. Schizophrenia presents similarly, but symptoms last longer than 6 months. This patient's disorganized behavior of covering windows with foil appears to be driven by paranoid delusions about enemy radio signals. Antipsychotics are the mainstay of treatment of both schizophreniform disorder and schizophrenia.

Incorrect Answers: A, B, C, and D.

Delusional disorder (Choice A) involves the presence of one or more delusions for 1 month or longer with no other schizophrenia symptoms such as hallucinations or gross disorganization in behavior or thought. This patient's disorganized behaviors are more typical of schizophreniform disorder or schizophrenia. Also, delusions in delusional



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☒ E) Schizophreniform disorder

Correct Answer: E.

According to the DSM-5, patients with schizophreniform disorder must demonstrate two of the following: delusions, hallucinations, disorganized speech, or disorganized behavior (known as positive symptoms), or flat affect, apathy, or alogia (known as negative symptoms). To meet diagnostic criteria, patients must demonstrate symptoms for longer than 1 month and less than 6 months. Two-thirds of patients with schizophreniform disorder ultimately develop schizophrenia. Schizophrenia presents similarly, but symptoms last longer than 6 months. This patient's disorganized behavior of covering windows with foil appears to be driven by paranoid delusions about enemy radio signals. Antipsychotics are the mainstay of treatment of both schizophreniform disorder and schizophrenia.

Incorrect Answers: A, B, C, and D.

Delusional disorder (Choice A) involves the presence of one or more delusions for 1 month or longer with no other schizophrenia symptoms such as hallucinations or gross disorganization in behavior or thought. This patient's disorganized behaviors are more typical of schizophreniform disorder or schizophrenia. Also, delusions in delusional disorder are typically simpler than the complex paranoid delusional schema demonstrated by this patient.

Paranoid personality disorder (Choice B) is a cluster A personality disorder characterized by a pervasive mistrust of others and viewing others as possessing malicious intent. Personality disorders present early in life, and this patient's new bizarre behavior in the past month is more likely caused by schizophreniform disorder. Additionally, his disorganized behavior is more typical of schizophreniform disorder than paranoid personality disorder.

Schizoaffective disorder (Choice C) and schizophrenia (Choice D) are characterized by a chronic course of delusions, hallucinations, disorganized speech, disorganized behavior, and/or negative symptoms (eg, flat affect, apathy, alogia). Schizoaffective disorder also includes major mood episodes. Symptoms last longer than 6 months, whereas this patient's symptoms have only lasted 1 month.

Educational Objective: Patients with schizophreniform disorder demonstrate two of the following: delusions, hallucinations, disorganized speech, or disorganized behavior (known as positive symptoms), or flat affect, apathy, or alogia (known as negative symptoms). To meet diagnostic criteria, patients must demonstrate symptoms for longer than 1 month and less than 6 months.



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- ✓ 43. A nurse is preparing a 65-year-old man for discharge when the patient has the acute onset of left-sided weakness. Two days ago, he was admitted to the hospital for treatment of dehydration. He has type 2 diabetes mellitus and hypertension. His medications are pioglitazone and lisinopril. His temperature is 37.1°C (98.8°F), pulse is 82/min, respirations are 16/min, and blood pressure is 175/88 mm Hg. Examination shows left lower facial weakness, left hemiplegia, and dysarthria. No other abnormalities are noted. Results of laboratory studies are within the reference ranges. CT scan of the head shows no abnormalities. Which of the following is the most appropriate next step in management?
- ☐ A) Carotid ultrasonography
 - ☐ B) Intravenous administration of heparin
 - ☐ C) Intravenous administration of labetalol
 - ☒ D) Intravenous administration of tissue plasminogen activator
 - ☐ E) MRI of the brain

Correct Answer: D.

Cerebrovascular accidents (eg, cerebral infarctions, strokes) occur because of ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80% to 85% of strokes are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15% to 20% of strokes are hemorrhagic due to blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Classically, strokes manifest as a neurologic deficit related to the affected part of the brain. Risk factors for strokes include smoking, hypertension, diabetes, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Diagnosis is made by clinical evaluation and neuroimaging to confirm the diagnosis and exclude hemorrhage. Treatment depends on the duration of time since the patient was at their neurologic baseline. If the patient was at their neurologic baseline less than 4.5 hours before presentation (as in this case), they are a candidate for thrombolytic therapy (eg, alteplase). If the patient was at their neurologic baseline more than 4.5 hours before presentation, then they are not a candidate for thrombolytic therapy and should instead be treated with aspirin therapy. This patient should be consented for and treated with tissue plasminogen activator, along with other appropriate measures for acute ischemic stroke.

Incorrect Answers: A, B, C, and E.

Carotid ultrasonography (Choice A) is appropriate in the evaluation of patients experiencing acute ischemic stroke to assess for possible contributory lesions such as



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Help



Pause

Cerebrovascular accidents (eg, cerebral infarctions, strokes) occur because of ischemic or hemorrhagic loss of blood supply to the brain. Approximately 80% to 85% of strokes are ischemic, commonly arising from thromboembolic disease (eg, middle cerebral artery occlusion from a thrombus), whereas 15% to 20% of strokes are hemorrhagic due to blood vessel rupture (eg, hypertension-related intraparenchymal hemorrhage from a perforating artery). Classically, strokes manifest as a neurologic deficit related to the affected part of the brain. Risk factors for strokes include smoking, hypertension, diabetes, carotid or intracranial atherosclerotic disease, history of hypercoagulability, atrial fibrillation, and advanced age. Diagnosis is made by clinical evaluation and neuroimaging to confirm the diagnosis and exclude hemorrhage. Treatment depends on the duration of time since the patient was at their neurologic baseline. If the patient was at their neurologic baseline less than 4.5 hours before presentation (as in this case), they are a candidate for thrombolytic therapy (eg, alteplase). If the patient was at their neurologic baseline more than 4.5 hours before presentation, then they are not a candidate for thrombolytic therapy and should instead be treated with aspirin therapy. This patient should be consented for and treated with tissue plasminogen activator, along with other appropriate measures for acute ischemic stroke.

Incorrect Answers: A, B, C, and E.

Carotid ultrasonography (Choice A) is appropriate in the evaluation of patients experiencing acute ischemic stroke to assess for possible contributory lesions such as carotid plaques (a known cause of thromboembolic stroke). However, treatment with thrombolytics should not be delayed in favor of this investigation; it can occur within hours to days following presentation of a stroke, to determine if the patient requires interventions on the carotid artery such as endarterectomy.

Intravenous administration of heparin (Choice B) may be appropriate if the patient was experiencing a stroke from dissection of a carotid or vertebral artery, however this would generally be visualized on CT angiography. Acute ischemic stroke from a thromboembolic event is more likely in this case.

Intravenous administration of labetalol (Choice C) is appropriate in cases of hypertensive emergency, or in cases of stroke where thrombolytics are used. In cases of thrombolytic use, blood pressure should be less than 185/110 mm Hg before starting thrombolytics and less than 180/105 mm Hg after administration of thrombolytics. This patient's blood pressure is below this range.

MRI of the brain (Choice E) is appropriate in the evaluation of a patient with probable stroke, however, obtaining further diagnostic studies in this patient with a classic stroke presentation would delay appropriate therapy. Earlier time of administration of thrombolytics is correlated with improved neurologic outcomes and is the most appropriate next step. MRI, along with carotid ultrasonography, can occur in hours to days after occurrence of an acute ischemic stroke.

Educational Objective: Acute cerebrovascular accident management depends on the time the patient was last known to be at their neurologic baseline. Patients who were at their baseline less than 4.5 hours before presentation and do not show a brain hemorrhage on neuroimaging are candidates for thrombolytic therapy. Patients who were at their baseline more than 4.5 hours before presentation should instead be treated with aspirin therapy.



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Pause



44. A 4-year-old boy is brought to the office by his parents because of a 2-year history of sunburns and redness of both eyes. His parents say his skin becomes red and irritated after 15 minutes of sun exposure. Whenever he is outside, his eyes become red. Growth and development otherwise have been appropriate for age. Vaccinations are up-to-date. He is at the 50th percentile for height, weight, and BMI. His temperature is 37.0°C (98.6°F), pulse is 106/min, and respirations are 24/min. A photograph of the skin is shown. Ocular examination discloses injection of the conjunctival vessels without discharge bilaterally. Which of the following is most likely to develop in this patient during the next 10 years?

- ☐ A) Albinism
- ☐ B) Atopic dermatitis
- ☐ C) Colon cancer
- ☐ D) Dyshidrosis
- ☐ E) Seborrheic dermatitis
- ☒ F) Squamous cell carcinoma



Correct Answer: F.

Patients with xeroderma pigmentosum are at a high risk for the development of squamous cell carcinoma. Xeroderma pigmentosum is an autosomal recessive disorder

Patients with xeroderma pigmentosum are at a high risk for the development of squamous cell carcinoma. Xeroderma pigmentosum is an autosomal recessive disorder associated with mutations in genes involved in nucleotide excision repair needed to combat UV light damage. Xeroderma pigmentosum commonly presents in early childhood as severe skin and ocular photosensitivity to limited UV light exposure, as in this patient. Xeroderma pigmentosum is associated with premature photoaging of the skin including the development of freckling and solar lentigines, early development of skin cancers in childhood, and photophobia. Patients with xeroderma pigmentosum must abide by strict photoprotection to prevent development of skin cancer and undergo regular skin cancer screening.

Incorrect Answers: A, B, C, D, and E.

Albinism (Choice A) is a rare family of autosomal recessive disorders characterized by absent pigmentation of skin, hair, and eyes. Albinism is present at birth. Patients are photosensitive and at a high risk for developing skin cancer. While albinism is associated with the development of skin cancers at an early age, it is not associated with early development of signs of photoaging including numerous freckles and solar lentigines.

Atopic dermatitis (Choice B) may be associated with various genetic conditions and is characterized by pruritus and development of ill-defined, erythematous, excoriated, and often lichenified plaques. Atopic dermatitis has a predilection for the flexural surfaces in children and is treated with topical emollients and corticosteroids. Atopic dermatitis is not associated with severe photosensitivity, early sun damage, or early development of skin cancers.

Colon cancer (Choice C) is associated with dermatologic findings including sebaceous adenomas and sebaceous carcinoma in patients with Muir-Torre syndrome. Muir-Torre syndrome is related to mutations in DNA mismatch repair genes and is associated with sebaceous carcinoma and colon cancer. While colon cancer may be related to dermatologic findings in Muir-Torre syndrome, it is not associated with the severe photosensitivity seen in xeroderma pigmentosum.

Dyshidrosis (Choice D) is a variant of atopic dermatitis characterized by the development of vesicles along the lateral aspects of the digits. Dyshidrosis is worsened by frequent hand washing, water submersion, and other irritants. Dyshidrosis is not associated with photosensitivity or other findings of xeroderma pigmentosum.

Seborrheic dermatitis (Choice E) is an eczematous skin condition related to *Malassezia* species. Seborrheic dermatitis can present as dandruff of the scalp, eyebrows, or nasolabial or melolabial folds of the face. Seborrheic dermatitis is commonly treated with topical azole antifungals, like ketoconazole. Seborrheic dermatitis is not associated with severe photosensitivity.



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- ✓ 45. A 76-year-old man is brought to the clinic by his wife for consultation regarding left total knee replacement. During the past 2 years, he has required a cane to ambulate because of increasingly severe left knee pain. He has hypertension, major depressive disorder, and early stage dementia, Alzheimer type. His medications are nifedipine, sertraline, and aspirin. He lives with his wife, who assists him in all activities of daily living. He is oriented to person and place but not year. Pulse is 78/min, and blood pressure is 160/68 mm Hg. Physical examination shows crepitus and moderate pain on passive range of motion of the left knee. There is no warmth, erythema, or effusion. On mental status examination, he has a happy mood and congruent affect. He registers three of three objects immediately but recalls zero after 1 minute. The patient is provided with information regarding total knee replacement. When he is asked if he understands the benefits of the procedure, he says, "It will fix my knee." He is then given information about the risks and alternative treatment options. When asked about his understanding, he replies, "It will be OK." Which of the following is the greatest indication that this patient may not have sufficient capacity for informed consent?
- ☐ A) Complete dependence on his wife in activities of daily living
 - ☐ B) Dementia, Alzheimer type
 - ☒ C) Inability to articulate the risks and benefits of the operation
 - ☐ D) Major depressive disorder
 - ☐ E) Poorly controlled hypertension

Correct Answer: C.

To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. This patient cannot demonstrate that he appreciates the risks of the operation. As such, the physician should obtain consent from a surrogate decision-maker (eg, his wife or power of attorney). Though some cognitively impaired or depressed patients may lack capacity for specific decisions, these patients should not be automatically assumed to lack decisional capacity. All patients should be given the opportunity to answer capacity questions specific to a decision to honor their autonomy. Capacity is time- and decision-specific. For instance, a patient may be able to demonstrate capacity for a simple and low-risk decision but not for a complex and high-risk decision. A patient's cognitive abilities to understand the risks of a decision can also fluctuate, especially in acute conditions, such as delirium. As such, capacity should be reassessed frequently.

Incorrect Answers: A, B, D, and E.



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☒ C) Inability to articulate the risks and benefits of the operation

☐ D) Major depressive disorder

☐ E) Poorly controlled hypertension

Correct Answer: C.

To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice for their personal circumstances, and illustrate an ability to reason through the options. This patient cannot demonstrate that he appreciates the risks of the operation. As such, the physician should obtain consent from a surrogate decision-maker (eg, his wife or power of attorney). Though some cognitively impaired or depressed patients may lack capacity for specific decisions, these patients should not be automatically assumed to lack decisional capacity. All patients should be given the opportunity to answer capacity questions specific to a decision to honor their autonomy. Capacity is time- and decision-specific. For instance, a patient may be able to demonstrate capacity for a simple and low-risk decision but not for a complex and high-risk decision. A patient's cognitive abilities to understand the risks of a decision can also fluctuate, especially in acute conditions, such as delirium. As such, capacity should be reassessed frequently.

Incorrect Answers: A, B, D, and E.

Complete dependence on his wife in activities of daily living (Choice A), dementia, Alzheimer type (Choice B), and major depressive disorder (Choice D) decrease a patient's likelihood of demonstrating capacity. However, cognitively impaired or depressed patients should not be automatically assumed to lack decisional capacity. This patient's lack of capacity is most directly dictated by his inability to appreciate the risks of the operation. As well, major depressive disorder appears less active currently given his bright affect.

Poorly controlled hypertension (Choice E) may lead to progressively worsening cognition, which may decrease a patient's likelihood of demonstrating capacity. However, capacity is dictated by questions specific to a decision.

Educational Objective: To meet the criteria for decisional capacity, patients must express a consistent choice, demonstrate an understanding of the risks and benefits of the choice, demonstrate an appreciation of the significance of the choice, and illustrate an ability to reason through the options. Regardless of a patient's cognitive ability, physicians should assess patients' decisional capacity for each specific care decision.



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46. A 23-year-old woman comes to the emergency department because of a 3-month history of increasingly painful circumferential headaches that are most severe when she lies down. During this time, she also has had intermittent episodes of “grayed out” vision with constriction of her visual fields. The episodes last 5 seconds and resolve spontaneously. The patient was treated for *Chlamydia trachomatis* infection 2 years ago. She has no other history of serious illness and takes no medications. Her diet consists mainly of “junk food.” She appears anxious. She is 157 cm (5 ft 2 in) tall and weighs 124 kg (273 lb); BMI is 50 kg/m². Her blood pressure is 165/82 mm Hg; other vital signs are within normal limits. Findings on fundoscopic examination of the right eye are shown; similar findings are noted in the left eye. The remainder of the examination shows no abnormalities. Lumbar puncture is performed, and opening pressure is 39 cm H₂O. Results of cerebrospinal fluid analysis are within the reference ranges. MRI of the brain and MR venography show no abnormalities. Which of the following is most likely to have prevented this patient's current symptoms?
- ☐ A) Use of an oral contraceptive
 - ☐ B) Vitamin A supplementation
 - ☒ C) Weight loss

- ☒ C) Weight loss
- ☐ D) Yearly glaucoma testing
- ☐ E) Yearly measurement of blood pressure

Correct Answer: C.

Idiopathic intracranial hypertension (IIH) is caused by inadequate resorption of cerebrospinal fluid (CSF) and is characterized by signs of increased intracranial pressure including headache, papilledema, and increased opening pressure on lumbar puncture without gross abnormality on neuroimaging. It is primarily seen in young women with increased BMI. Prolonged increased intracranial pressure may cause chronic headaches and optic nerve damage leading to permanent vision loss. Headaches that are secondary to increased intracranial pressure are often worse when lying down and relieved by standing. The most common risk factors for the development of IIH include female sex and obesity. Medications associated with IIH include tetracyclines, danazol, and growth hormone. CT scan is an important initial step in the evaluation of a patient with papilledema and suspected IIH to exclude the presence of an intracranial mass. If the CT scan is normal, lumbar puncture is the most appropriate next step to confirm the presence of increased intracranial pressure. Management of IIH includes weight reduction, carbonic anhydrase inhibitors, therapeutic lumbar puncture, and, in severe or refractory cases, surgical intervention with CSF shunting or optic nerve sheath fenestration.

Incorrect Answers: A, B, D, and E.

Use of an oral contraceptive (Choice A) is incorrect. Numerous studies have failed to demonstrate a causal relationship between the use of oral contraceptives and IIH, although there may be cases in which the use of an oral contraceptive is associated with weight gain. The use of an oral contraceptive is not contraindicated for a patient with IIH, nor is the use of one likely to have prevented this patient's current presentation.

Vitamin A supplementation (Choice B) is incorrect. Vitamin A deficiency leads to xerophthalmia, characterized by corneal and conjunctival dryness, which may lead to corneal ulceration and scarring. Night blindness also occurs due to deficiency of retinol, a vitamin-A derived co-factor necessary for production of rhodopsin and for normal rod photoreceptor functioning. Vitamin A deficiency is rare in developed countries, although it may occur in patients who have undergone gastric bypass surgery.

Yearly glaucoma testing (Choice D) is incorrect. Glaucoma is an optic neuropathy characterized by optic nerve cupping and visual field defects due to loss of retinal



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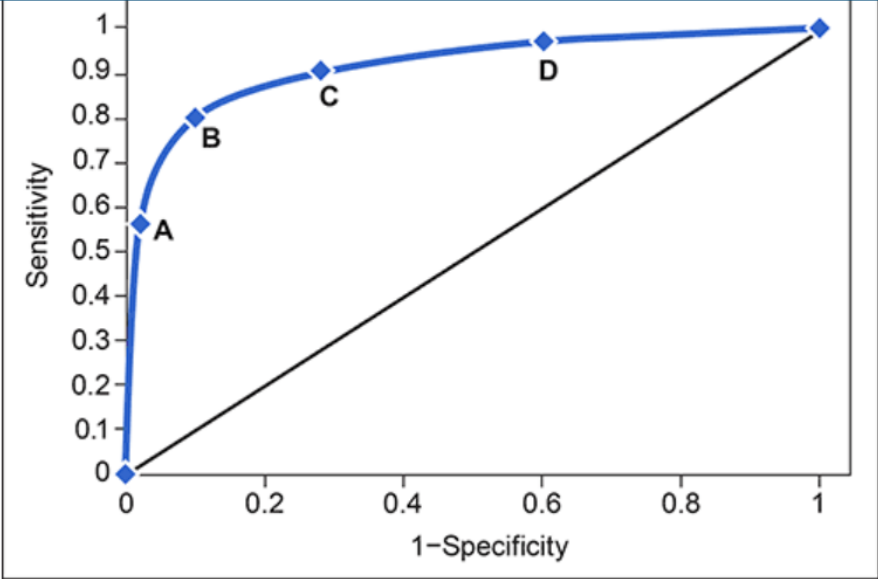
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Help



Pause



47. A clinician would like to increase the accuracy of diagnosing streptococcal pharyngitis among his pediatric patients in order to begin treatment sooner. He considers implementing a new diagnostic test for streptococcal pharyngitis and reviews the receiver operator characteristic (ROC) curve shown. Which of the following is the most likely clinical impact of using cut point C instead of cut point B as a positive test?
- ☐ A) More patients will be correctly diagnosed as being infected
 - ☐ B) More patients will be correctly diagnosed as not being infected
 - ☒ C) More patients will be incorrectly diagnosed as being infected

- ☒ C) More patients will be incorrectly diagnosed as being infected
- ☐ D) More patients will be incorrectly diagnosed as not being infected
- ☐ E) Cannot be determined based on the data provided

Correct Answer: C.

More patients will be incorrectly diagnosed as being infected is correct. The transition from point B to C will increase the sensitivity of the test, meaning more patients with streptococcal pharyngitis will be captured in the transition from point B to C. However, this same transition will decrease the specificity of the test and increase the number of false positives for the test. False positives represent patients that do not have the disease, streptococcus pharyngitis in this case, but are not clinically infected.

Incorrect Answers: A, B, D, and E.

More patients will be correctly diagnosed as being infected (Choice A) is incorrect. In this study, a cutoff point with a higher specificity would need to be chosen to increase the number of patients being correctly diagnosed as infected. For example, moving from point C to B or B to A would increase the test's specificity and lead to a higher proportion of patients with disease being correctly diagnosed as infected.

More patients will be correctly diagnosed as not being infected (Choice B) is incorrect. In the case of transition from point B to C will decrease the specificity of the test. Moving from point C to B or B to A would increase the test's specificity and lead to more patients being correctly diagnosed as not being infected.

More patients will be incorrectly diagnosed as not being infected (Choice D) is incorrect. The transition from point B to C will increase the number of patients who test positive, both patients who represent true and false positives. This transition will lead to less false negatives, which are patients with streptococcus pharyngitis who are incorrectly diagnosed as not being infected.

Cannot be determined based on the data provided (Choice E) is incorrect. In the case above, the move from point B to C increases the sensitivity of the test, at the price of specificity. Therefore, more patients will be diagnosed with streptococcus pharyngitis, however, there will be more patients who represent false positives, or patients without streptococcus pharyngitis who are diagnosed with the condition.

Educational Objective: A receiver operator characteristic curve may be used to evaluate the sensitivity and specificity of a test. Transitioning from one point to another on the curve may increase or decrease the sensitivity or specificity of a test while having the inverse effect on the other. Choosing is an example where the sensitivity of a test is



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✓ 48. A 17-year-old girl comes to the office because of irregular menstrual periods since menarche at the age of 13 years. Menses occur at 28- to 40-day intervals and last 10 days; they are not painful. Menstrual flow is heavy. Her last menstrual period was 45 days ago. She has no history of serious illness and takes no medications. She became sexually active 6 months ago with one male partner, and they use condoms consistently. The patient is 165 cm (5 ft 5 in) tall and weighs 91 kg (200 lb); BMI is 33 kg/m². Vital signs are within normal limits. Sexual maturity rating is stage 5 for breast and pubic hair development. Physical examination, including pelvic examination, shows no abnormalities. Which of the following is the most appropriate next step in management?

- ☐ A) Oral contraceptive therapy
- ☐ B) Pap smear
- ☐ C) Pelvic ultrasonography
- ☒ D) Pregnancy test
- ☐ E) Progestin challenge test

Correct Answer: D.

Irregular or missed menses (anovulation) can have multiple causes, including pregnancy, polycystic ovary syndrome, abnormalities or immaturity of the hypothalamic-pituitary-ovarian axis, menopause or premature ovarian failure, inadequate nutrition, chromosomal abnormalities, and thyroid disorders. Anovulation presents with irregular intervals of menstruation, associated with heavy vaginal bleeding when menses occur due to persistent endometrial development. The first step in evaluating missed or irregular menstrual cycles in any female patient of childbearing age is to perform a pregnancy test. Structural or functional causes can then be evaluated through ultrasonography and hormonal testing.

Incorrect Answers: A, B, C, and E.

Oral contraceptive therapy (Choice A) is a reasonable and appropriate option for pregnancy prophylaxis and for regulation of the immature hypothalamic-pituitary axis in female patients with irregular menses. Prior to initiation of any hormonal therapy, the pregnancy status of the patient must be known.

Pap smear (Choice B) is recommended every 3 years in women aged 21 to 29 years and every 5 years in conjunction with human papillomavirus co-testing (every 3 years if co-testing is not performed) in women aged 30 to 65 years. This patient does not yet meet screening recommendations, and her symptoms are more likely related to



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☐ E) Progesterin challenge test

Correct Answer: D.

Irregular or missed menses (anovulation) can have multiple causes, including pregnancy, polycystic ovary syndrome, abnormalities or immaturity of the hypothalamic-pituitary-ovarian axis, menopause or premature ovarian failure, inadequate nutrition, chromosomal abnormalities, and thyroid disorders. Anovulation presents with irregular intervals of menstruation, associated with heavy vaginal bleeding when menses occur due to persistent endometrial development. The first step in evaluating missed or irregular menstrual cycles in any female patient of childbearing age is to perform a pregnancy test. Structural or functional causes can then be evaluated through ultrasonography and hormonal testing.

Incorrect Answers: A, B, C, and E.

Oral contraceptive therapy (Choice A) is a reasonable and appropriate option for pregnancy prophylaxis and for regulation of the immature hypothalamic-pituitary axis in female patients with irregular menses. Prior to initiation of any hormonal therapy, the pregnancy status of the patient must be known.

Pap smear (Choice B) is recommended every 3 years in women aged 21 to 29 years and every 5 years in conjunction with human papillomavirus co-testing (every 3 years if co-testing is not performed) in women aged 30 to 65 years. This patient does not yet meet screening recommendations, and her symptoms are more likely related to anovulation as opposed to cervical cytologic abnormalities.

Pelvic ultrasonography (Choice C) is appropriate in the evaluation of menstrual irregularities if a structural cause is suspected. In general, structural abnormalities such as imperforate hymen present with primary amenorrhea as opposed to irregular menses.

Progesterin challenge test (Choice E) is used in the evaluation of anovulation. Progesterone therapy acts to inhibit follicle-stimulating hormone and luteinizing hormone, preventing ovulation, as well as to maintain the endometrial lining and cause its transition to a secretory, rather than proliferative, endometrium. When progesterone is withdrawn, menstruation occurs if the anovulation is because of an abnormality or irregularity of the hypothalamic-pituitary-ovarian axis, as is often the case in young women. Menstruation will not occur if the abnormal bleeding is due to a structural abnormality of the uterus or estrogen deficiency.

Educational Objective: Anovulation is caused by a variety of underlying pathologies but commonly presents with irregular intervals of menstruation associated with heavy vaginal bleeding when menses do occur. It is evaluated first via a pregnancy test, and then via hormonal and/or radiologic studies.



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- ✓ 49. A 20-year-old man, who is a US soldier, is evaluated in the hospital 1 day after transfer from a military field hospital following injury from an improvised explosive device. He was thrown approximately 20 feet during the explosion and sustained an open fracture of the right tibia and fibula. He was stabilized and intubated in the field hospital prior to being transferred. CT scans of the head, neck, chest, abdomen, and pelvis have shown no abnormalities. The patient underwent open reduction and external fixation of the fractures and was extubated 1 hour ago. Medical history is unremarkable. Medications are morphine and cephalexin. Temperature is 37.7°C (99.8°F), pulse is 100/min, respirations are 20/min, and blood pressure is 120/80 mm Hg. Pulse oximetry on 4 L/min of oxygen by nasal cannula shows an oxygen saturation of 96%. Physical examination shows an external fixation device on the right lower extremity with a clean dressing. This patient is at greatest risk for which of the following?
- ☐ A) Blurred vision
 - ☐ B) Decreased sense of smell
 - ☒ C) Hearing loss
 - ☐ D) Numbness of the fingers

Correct Answer: C.

Blast injuries are caused by a blast wave moving through the body, often occurring from an explosion. These blast waves cause more extensive damage to organs with higher levels of air and commonly affect the ears, lungs, brain, eyes, and abdomen. The ear is often the first organ affected by a blast injury with symptoms including hearing loss, tinnitus or ringing, as well as ear drainage. This patient was exposed to a high-energy blast, which puts him at the greatest risk for developing hearing loss because of rapid exposure to changes in pressure. Patients exposed to blast injuries may also be struck by flying objects such as shrapnel, thrown by the blast, or exposed to chemicals or fallout from the source of the explosion.

Incorrect Answers: A, B, and D.

Blurred vision (Choice A) may occur because of a blast injury. However, the ear is more sensitive to damage from blast injuries. This patient would most likely develop hearing loss because of the explosion.



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50. A 67-year-old man comes to the office because of a 3-month history of worsening difficulty swallowing when he eats solid food, especially meats. The patient has no difficulty eating soup and drinking liquids, but swallowing solid foods causes choking. He reports a 9-kg (20-lb) weight loss since his symptoms began, which he attributes to his difficulty with eating. Medical history is remarkable for nephrolithiasis and restless legs syndrome. His only medication is pramipexole. The patient has smoked one-half pack of cigarettes daily for 50 years. He does not drink alcoholic beverages or use illicit drugs. He is 185 cm (6 ft 1 in) tall and weighs 68 kg (150 lb); BMI is 20 kg/m². Temperature is 37.0°C (98.6°F), pulse is 64/min, respirations are 16/min, and blood pressure is 118/78 mm Hg. Physical examination discloses no abnormalities. Which of the following is the most appropriate next step in evaluation?

- ☐ A) CT scan of the abdomen and pelvis
- ☒ B) Esophagogastroduodenoscopy
- ☐ C) Ultrasonography of the neck
- ☐ D) Urine albumin concentration
- ☐ E) Videofluoroscopic swallow study

Correct Answer: B.

This patient's gradual dysphagia and weight loss is consistent with carcinoma of the esophagus. Typically, dysphagia begins with solids then gradually worsens to involve liquids. Risk factors for esophageal cancer include age, gastroesophageal reflux disease, Barrett esophagus, smoking, obesity, and alcohol use. Diagnosis of esophageal cancer should begin with direct visualization with esophagogastroduodenoscopy (EGD), which can also involve biopsy and pathology testing. On EGD, early esophageal cancer can present as superficial plaques, nodules, or ulcerations. Advanced carcinomas can present as strictures, large ulcerated masses, or circumferential masses.

Incorrect Answers: A, C, D, and E.

CT scan of the abdomen and pelvis (Choice A) can be helpful in the diagnosis of large organ pathologies such as small-bowel obstruction, appendicitis, splenic injury, diverticulitis, or perforation. The most appropriate path to diagnosis of a suspected esophageal malignancy is direct visualization and tissue biopsy with EGD. An abdominal CT scan may not show a small malignancy and would not be diagnostic. A CT scan may be used later for cancer staging but would not be the most appropriate initial step.

- ☐ D) Urine albumin concentration
- ☐ E) Videofluoroscopic swallow study

Correct Answer: B.

This patient's gradual dysphagia and weight loss is consistent with carcinoma of the esophagus. Typically, dysphagia begins with solids then gradually worsens to involve liquids. Risk factors for esophageal cancer include age, gastroesophageal reflux disease, Barrett esophagus, smoking, obesity, and alcohol use. Diagnosis of esophageal cancer should begin with direct visualization with esophagogastroduodenoscopy (EGD), which can also involve biopsy and pathology testing. On EGD, early esophageal cancer can present as superficial plaques, nodules, or ulcerations. Advanced carcinomas can present as strictures, large ulcerated masses, or circumferential masses.

Incorrect Answers: A, C, D, and E.

CT scan of the abdomen and pelvis (Choice A) can be helpful in the diagnosis of large organ pathologies such as small-bowel obstruction, appendicitis, splenic injury, diverticulitis, or perforation. The most appropriate path to diagnosis of a suspected esophageal malignancy is direct visualization and tissue biopsy with EGD. An abdominal CT scan may not show a small malignancy and would not be diagnostic. A CT scan may be used later for cancer staging but would not be the most appropriate initial step.

Ultrasonography of the neck (Choice C) would be nondiagnostic in a case of esophageal malignancy. Ultrasonography of the neck can be used to diagnose thyroid disorders such as cyst, goiter, or thyroid malignancy.

Urine albumin concentration (Choice D) is used in the workup of diabetic nephropathy. Diabetic nephropathy occurs following nonenzymatic glycosylation of the glomerular basement membrane and efferent arterioles, characteristically presenting as Kimmelstiel-Wilson lesions on light microscopy. It progresses over time in patients with diabetes mellitus, initially beginning as microalbuminuria, which can subsequently lead to macroalbuminuria and then end-stage renal disease.

Videofluoroscopic swallow study (Choice E) or barium swallow study would be helpful in the diagnosis of anatomic esophageal pathologies such as pharyngoesophageal (Zenker) diverticulum, achalasia, and diffuse esophageal spasm. However, this patient's weight loss and smoking history raise concern for esophageal malignancy, which should be diagnosed with EGD.

Educational Objective: Esophageal cancer presents with gradual onset of dysphagia and weight loss. Diagnosis involves esophagogastroduodenoscopy and biopsy.



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